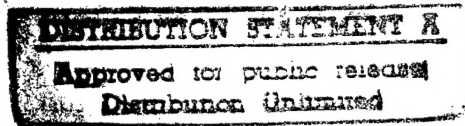


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11 January 1983

USSR REPORT

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SCIENTIFIC GROUNDS PROVIDED FOR DETERMINING PRESENCE OF GAS IN COUNTRY

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 4-6

[Article by Doctor of Geological-Mineralogical Sciences V. I. Yermakov, Candidate of Geological-Mineralogical Sciences Ye. V. Zakharov and candidate of Geological-Mineralogical Sciences V. P. Stupakov]

[Text] Analysis of the geological preconditions for developing exploration and prospecting in our country shows that a number of major scientific problems will have to be solved before the reserves of gas and gas condensate can be increased. Their solution will doubtlessly promote successful completion of the plans of the 11th Five-Year Plan and further expansion of gas industry's raw material base.

The Soviet Union's gas industry created a high-output raw material base within a short time. More than 850 deposits of gas were discovered in different regions of the country, and large gas-bearing provinces were revealed, creating favorable possibilities for increasing gas extraction and for improving the structure of the fuel and energy balance.

The strategy of prospecting for gas deposits developed by collectives of geologists, based on revealing the laws governing distribution of gas resources in the subsoil, has justified itself completely.

The high effectiveness of gas prospecting and exploration was achieved to a significant extent owing to practical introduction of the results of scientific research conducted by large collectives of specialized geologists of the USSR Ministry of Geology, the USSR Ministry of Gas Industry, the USSR Ministry of Petroleum Industry and the USSR Academy of Sciences. Coordination of the research and its concentration upon the main problems associated with preparing explored gas reserves and with creating raw material bases in different regions of the country with the purpose of organizing them into large gas and gas condensate extraction centers played a major role in this effort. We should distinguish the following among the most important scientific developments completed on the basis of intersector programs and having decisive significance to development of gas industry as the national economy's leading sector with its own raw material base:

confirmation of the high abundance of gas in the USSR;

separate forecasts of the abundance of petroleum and gas;

quantitative evaluation of the abundance of gas in the USSR;

validation of the most effective directions of gas prospecting and exploration in five-year and long-range planning;

regionalization of proposed reserves in relation to gas composition;

accelerated methods of exploring gas deposits;

extensive experimental industrial exploitation of the deposits.

Regional investigation of the USSR's geological structure revealed zones where the foundation dips deeply, characterized by large masses of weakly disturbed sedimentary rock, with which the bulk of the gas resources are associated. At present, a few ultradeep depressions hold practically all of the country's explored gas reserves. Also associated with them are the main prospects for further increases in the reserves. The role played by petroleum deposits in such zones is significantly smaller.

In recent years a number of scientific collectives of different ministries, the USSR Academy of Sciences, Moscow State University and other organizations have been working on the problem of determining the abundance of petroleum and gas on the shelves of external and inland seas, and the program of studying the World Ocean has been expanding. The area of the World Ocean is known to be triple that of the land area. Results obtained in the course of research on the structure of its floor fundamentally altered previous notions concerning the structure and basic stages of development of the earth's crust as a whole.

Problems associated with the way major zones of petroleum and gas accumulations form are being examined from different positions as well. Modern hypotheses concerning development of the earth's crust on the basis of plate tectonics and rift genesis, presently being developed in institutes of the USSR Academy of Sciences and in sector scientific research centers, in which horizontal movements of large segments of the earth's crust are given the decisive role, are being accounted for in evaluations of the potential resources of gas and petroleum, in substantiating the most promising directions of their prospecting and in gas and geological regionalizing of promising territories and water basins.

Gas abundance at great depths is a problem occupying a noticeable place in the scientific research of the institutes. It has become especially important in a number of the country's regions, and mainly in its European part, where all of the gas deposits in the upper horizons have basically been revealed. The question as to vertical distribution of hydrocarbons is one of the most important directions of scientific research by the Moscow State University, the USSR Academy of Sciences and sector institutes. Work in this direction should

significantly raise the dependability of evaluations of potential gas resources, and it should open up a possibility for determining the lower limits at which hydrocarbons can exist in liquid and gas phases in different thermobaric conditions, and for predicting gas composition.

Sector institutes have cooperated productively with the USSR Academy of Sciences in long-range planning of the development of our country's energy resources. Working together with the USSR Academy of Sciences and the USSR Ministry of Geology, the USSR Ministry of Gas Industry is drafting a program of the sector's long-range development, determining the sequence and main directions of developing predicted reserves and studying the effectiveness of prospecting for gas deposits in different stages of the development of promising territories.

A program of integrated development of gas deposits and of utilizing useful components of natural gas for chemical production is being developed jointly with institutes of the Ministry of Chemical Industry and the Ministry of Petroleum Refining and Petrochemical Industry. The resources and quality of crude gas and the general laws governing its distribution are being studied with this purpose. Colleagues of the Ural department of the USSR Academy of Sciences have taken part in this work.

The procedures of marine geothermal exploration are being developed and experimental projects are being conducted on the shelf of the Caspian Sea in the "Kaspmorneftegazprom" All-Union Production Association jointly with the Dagestan affiliate of the USSR Academy of Sciences on the basis of an agreement for scientific-technical cooperation. Practical introduction of geothermal exploration methods will make it possible to obtain additional information on the structure of local formations, and it will reflect positively upon the effectiveness of marine petroleum and gas prospecting and exploration.

The sector is also cooperating with institutes of the USSR Academy of Sciences to determine where gas came from, to find out what sort of geological complexes cause formation of gas, to determine how gas deposits form and to study other problems of gas geology.

The prospects for finding new gas deposits in "old" relatively well-studied regions may be clarified as geological science develops. In particular we need to arrive at an integrated geological-geophysical assessment of the possibility for developing promising sedimentary and volcanic-sedimentary deposits lying beneath the level already studied by drilling.

The most important problems that require solution are:

determining the basic, most favorable conditions for formation of zones characterized by the greatest concentration of underground gas resources and their distribution in regions of differing geotectonic history;

predicting presence of gas and changes in physical properties and chemical composition of gas and gas condensate depending on the concrete geological, geochemical, thermodynamic and hydrogeological conditions;

determining the grounds for distinguishing geologically different zones of petroleum and (or) gas accumulation, and within their limits, areas of probable development of different kinds of traps;

improving existing methods of quantitative prediction of petroleum and gas and developing new methods.

The theoretical and methodological principles of predicting the presence of gas require further development with the purpose of raising the reliability of petroleum and gas predictions. Deeper work on this problem would be impossible without fundamental geological research.

Owing to expansion of scientific research and practical efforts aimed at constantly increasing the quantity of new gas reserves and anticipating the demand, the information that is becoming available is increasing in quantity and undergoing qualitative change. This information is making it all the more obvious that we need to categorize the hydrocarbon resources presently being extracted in terms of technical possibilities and the economic feasibility of their development. Long-range planning must be based only on that part of the gas resources of subgroup D_1 , development of which would be profitable in modern technical and economic conditions.

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METHOD DESCRIBED FOR DETERMINING LONG-RANGE GAS YIELDS

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 8-10

[Article by Doctor of Technical Sciences A. I. Gritsenko, Doctor of Geological-Mineralogical Sciences V. I. Yermakov, Doctor of Geological-Mineralogical Sciences I. P. Zhabrev, Candidate of Technical Sciences G. A. Zotov and Candidate of Geological-Mineralogical Sciences V. P. Stupakov]

[Text] The method proposed here for predicting gas yields is one of the variants of deriving estimates in conjunction with drawing up master plans for development of gas extraction industry.

Long-range planning of the development of gas industry's raw material base and gas extraction has become especially important in the last few years.

Among the large number of problems that must be solved when drawing up long-range programs for development of gas industry, one of the principal ones is that of raising the reliability of quantitative assessments of the long-range gas abundance in the USSR and its individual regions, since these estimates are used to calculate the growth in gas reserves over a long period of time, which in turn allows us to determine the optimum gas extraction volume and maintain stable yields.

This article examines the basic aspects of a method of drawing up long-range (15-30 years) plans of gas yields from individual gas extracting regions, to be used as the basis for developing the region's raw material base. The article also examines some probabilities and statistics associated with the overall strategy of deposit development.

According to the classification adopted in the USSR, the initial potential resources of gas, P, include categories and groups of reserves differing in dependability: the accumulated yield, explored reserves $A+B+C_1$, promising reserves at known deposits C_{2m} and predicted reserves D (the latter includes reserves that have been located in different structures and areas, D_{1p} , and the unlocalized part of the predicted reserves D_1). In addition a qualitative assessment is made in relation to a subgroup of predicted reserves D_2 which is not included in the sum of the potential resources and which is used only as a basis for conducting regional research on poorly studied territories and stratigraphic complexes.

The reserves of categories A+B+C₁ include reserves of varying significance to the planning of extraction, to include reserves in deposits: presently experiencing the final stages of development and characterized by a large proportion of reserves yet to be extracted; introduced into exploitation but not yet in the period of declining yield; deposits that have been fully explored but not developed; deposits in different stages of exploration with an unidentical ratio of explored and potential reserves, and reserves contained in gas domes with industrially-feasible petroleum-bearing margins in different stages of development.

Categorized reserves are subdivided into groups depending on gas composition, whether the gas meets the quality standard or it is substandard and requires refining, the amount of hydrogen sulfide it contains and whether or not the gas requires preliminary purification or refining.

Gas reserves in category C_{2m} and subgroup D_{1p} are used to plan growth in gas reserves in the immediate future (5-7 years) and over the long range (15-20 years). Reserves of the unlocalized part of subgroup D₁ are also considered in growth calculations.

The reliability or the chances of confirmation of promising and predicted gas reserves differs for different regions. The chances of confirming reserves in category C_{2m} vary from 0.3 to 1.0, and they are usually minimal for old gas extraction regions in which potential resources have been utilized to a significant extent. The chances of confirming reserves in subgroup D_{1p} vary from 0.1 to 0.7. Predicted resources in subgroup D₁ reflect how well the territory of the USSR and its regions have been studied up to a particular period of time, and their value is a function of how extensively the territory has been explored.

An evaluation of initial potential resources is given, in accordance with the "Methodological Directives on Quantitative Evaluation of Predictions of Gas Abundance" presently in effect, as two values--geological reserves and reserves presently being extracted. The latter are calculated using a mean statistical coefficient of gas extraction, usually equal to 0.85.

Principles of Calculating Long-Range Increases in Gas Reserves

Growth in gas reserves is calculated in relation to individual gas-bearing regions with a consideration for: the extent to which initial potential resources have been realized; the status of reserves in category C_{2m} and of D_{1p} reserves, and the chances of their confirmation; the effectiveness dynamics of exploratory drilling (in thousands of cubic meters of gas per meter) over a lengthy period of the region's development; the complexity of the geological and economic conditions of conducting exploratory operations. Expert assessments by geological specialists in each region are also taken into account.

The world experience in exploration has established that the effectiveness of exploratory and prospecting operations grows in the initial period of a territory's development, until 25-30 percent of the initial potential gas resources are realized. After this the effectiveness of the work begins to decline.

An analysis of changes in effectiveness in different regions permits us to determine the growth in gas reserves for the country as a whole for a period of 15-20 years. Expert assessments are what are mainly used to determine growth in the more-remote future.

The following are distinguished in estimates of long-range growth of gas reserves:

the reserves of ethane-containing and hydrogen sulfide-containing gases of adequate quality for refining at gas and chemical complexes and for helium extraction. These volumes of gas are determined on the basis of the laws governing distribution of gases of different composition in the sedimentary rock of each region;

the reserves of gas in gas domes. The proportion gas domes represent within the total group of gas reserves is determined on the basis of available statistics for the region or for similar regions, and on the basis of genetic characteristics;

the reserves of gas typically found in deposits of different sizes.

The distribution of reserves in relation to deposit size is determined by analyzing the total of all revealed and hypothesized formations.

Method for Calculating Long-Range Constant Gas Extraction Levels

The evolved practice of calculating gas yields using a reserve availability coefficient or a multiple coefficient representing the quotient of current reserves divided by the annual gas yield is incorrect because the appearance of well-being is created in calculations of yields from old gas extraction regions and in justifications of gas extraction levels in new promising regions.

This can be explained by the fact that the gas reserves presently being extracted are not taken into account, as a consequence of which the unextracted part of the reserves, which is included in the balance of residual gas reserves, increases progressively as the accumulated yield rises. Moreover, analysis of the development of gas deposits has shown that after an average of 50-60 percent of the gas reserves are developed, the reserves enter into a period of diminishing yield. Under these conditions the unavoidable decline in gas extraction levels leads to an at first glance paradoxical phenomenon--growth in reserves available for current extraction owing to inclusion of residual reserves.

Thus the multiple coefficient does not reflect the real possibility for keeping the yield level constant, and it cannot be used to calculate long-range gas yield levels.

An analysis of the dynamics of gas reserves and gas yields in old gas extraction regions covering a 3-year period would show that in general, extraction begins to decline in a region before 50 percent of the reserves are extracted from the subsoil. The reason for this lies in both the high levels of annual gas extraction and incomplete refining of the available resources.

There is the important point that in most cases growth in extraction to its maximum value occurred following significant (more than 30 percent) exhaustion of potential gas resources and an inevitable decline in the effectiveness of exploratory drilling.

A distinction should be made between potential and planned gas yield levels. The potentially possible level is defined as the raw material base available upon inclusion of all revealed deposits into development, while the planned level is dependent upon the technical-economic possibilities of developing the resources.

The following raw data (matrix of raw data) are required for a prediction:

- 1) current explored reserves of worked deposits $(A+B+C_1) \rightarrow Q_p^0$ (the reserves of gas in deposits presently under development and included in the balance);
- 2) the accumulated gas yield since the beginning of the prediction (the quantity of gas extracted) $\rightarrow Q_{\Sigma}^0$;
- 3) explored gas reserves $(A+B+C_1)$ in discovered deposits that have not yet been developed $\rightarrow Q_p^{OT}$;
- 4) the increment in explored gas reserves $(A+B+C_1)$ within the time interval used in the calculations $(\Delta t) \rightarrow Q_p^{IP}$;
- 5) coefficients:

γ_1, γ_2 -- coefficients describing the quantity of explored undeveloped reserves Q_p^{OT} and the added explored reserves Q_p^{IP} subjected to development respectively. These coefficients account for the impossibility of initiating development of explored gas reserves in gas domes having industrially feasible petroleum-bearing margins; at small deposits that have been moth-balled because the technical-economic indicators indicate that gas extraction would presently be unprofitable; in deposits containing hydrogen sulfide that have been moth-balled for the time of the prediction (the calculation period) owing to absence of sulfur removing facilities; in deposits containing minerals meeting the quality standards but moth-balled to serve later as sources of material for gas and chemical complexes, or being exploited with an annual yield which would insure operation of gas and chemical complexes for a period of 30-40 years; in deposits being exploited on the basis of a cycling process system;

β -- coefficient characterizing gas losses in the bed (m^3 per m^3 extracted gas) during development owing to gas remaining: beyond the present gas-water contour, in nondraining portions of the bed; in peripheral zones due to presence of depressions and so on;

σ -- coefficient characterizing the rate of development of deposits in a period of constant yield and at an equal ratio of the annual extraction for this period, N_0 , to the initial gas reserves;

ϵ -- coefficient characterizing the decrease in the quantity of commercial gas sold in comparison with the quantity extracted from the bed owing to removal of

certain components from the latter. It is determined on the basis of the average composition of gas in explored reserves and in reserves presently under exploitation.

Coefficients γ_1 , γ_2 , β , δ_0 and σ are determined by expert assessment on the basis of an analysis of data on development of deposits in old gas extraction regions, technical-economic calculations for individual deposits, scientific-technical concepts used in plans for exploring and developing new deposits and predictions of technical progress.

The following circumstances must be considered when predicting extraction of gas from old gas extraction regions. Current explored reserves of deposits presently undergoing development consist of two parts:

the residual reserves of gas in deposits presently undergoing development, $Q_{\text{oct.o}}^p$, used in the prediction;

unextracted reserves accumulated by the beginning of the prediction period, accounted for by coefficient β . These reserves are defined as the difference between explored gas reserves $(Q_p^p + \frac{1}{\varepsilon} Q_{\Delta}^0)$ and the quantity of extracted gas, with a consideration for the unextracted part, Q_{Δ}^0 / β . Thus to calculate $Q_{\text{oct.o}}^p$ we use the formula

$$Q_{\text{oct.o}}^p = Q_p^p - \frac{(1-\beta)}{\beta\varepsilon} Q_{\Delta}^0. \quad (1)$$

Two variants are encountered in gas extraction prediction.

In the first variant we are given the annual extraction amounts N in the prediction period (usually broken down into five-year plans), and we must determine the availability of reserves at the given extraction levels, in the prediction period and beyond.

In this case the problem boils down to finding the calculated gas resources at the end of the calculation interval Δt . These resources consist of three parts:

in deposits undergoing development-- $Q_{\text{oct}}^p(\Delta t_2)$; , both old

$$Q_{\text{oct}}^p(\Delta t_1) = Q_{\text{oct.o}}^p - \frac{Q_{\Delta}^p}{\beta_1\varepsilon_1}; \quad (2)$$

and new (introduced into development in the interval Δt_1)

$$Q_{\text{oct}}^n(\Delta t_1) = Q_p^n - \frac{Q_{\Delta}^n}{\beta_2\varepsilon_2}; \quad (3)$$

in deposits not being developed (in the interval Δt_1)

$$Q_{p(\Delta t_1)}^{np} = (\gamma_1 Q_p^{op} + \gamma_2 Q_p^{np}) - \frac{N_{\Sigma}}{\delta_0 \sigma \varepsilon_3}. \quad (4)$$

Note that the following are assumed for a new time interval as the starting point:

$$Q_{\text{oct}}^p(\Delta t_2) = Q_{\text{oct}}^p(\Delta t_1) + Q_{\text{oct}}^H(\Delta t_1)$$

and

$$Q_p^{\text{OT}}(\Delta t_2) = Q_p^{\text{HP}}(\Delta t_1).$$

The following symbols are used in formulas (2)-(4): Q_{H}^p and Q_{H}^H --given total gas yield (in interval Δt_1) from old and new deposits presently under development; N_{H} --annual gas extraction (average in Δt_1) from new deposits placed into operation (determined as the difference between the given yield from the region and the yield from old deposits).

The calculations are continued until such time that $Q_p^{\text{HP}} = 0$. Next we determine the period of time during which we can maintain the annual extraction level attained, N_k :

$$T = \frac{Q_{\text{oct}}^p \delta_0 e}{N_k}. \quad (5)$$

In the second prediction variant, we are given the size of the raw material base and we must determine the annual gas yield N for the prediction period. It is determined for the first time interval Δt_1 using the formula

$$N(\Delta t_1) = \delta_0 e (\gamma_1 Q_p^{\text{OT}} + \gamma_2 Q_p^{\text{HP}}). \quad (6)$$

In subsequent time intervals we use the same formula (6), substituting $\gamma_1 Q_p^{\text{OT}}$ by Q_{oct}^H . The latter is calculated using a formula similar to (4).

This method can be carried out quite simply in the form of an algorithm and a computer program. In this case the program consists of two blocks. In the first we form the raw material base in accordance with the principles spelled out in the first two sections of this article. In the second block we run different prediction variants in accordance with formulas (1)-(6). When necessary a third block can be introduced into the program to calculate material outlays on developing the region, using enlarged indicators.

The method proposed in this article for predicting gas extraction from a region does not claim to be universal.

Various methods of building mathematical economic models of a region are a more-universal means of predicting gas yields. However, in such cases we encounter significant difficulties of a methodological and mathematical nature. Presently the All-Union Scientific Research Institute of Natural Gas is conducting intensive research in this area jointly with the Computer Center of the USSR Academy of Sciences and the VNIIEgazprom [not further identified].

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GAS INSTITUTE'S CONTRIBUTIONS TO GAS INDUSTRY DEVELOPMENT SUMMARIZED

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 10-12

[Article by Candidate of Technical Sciences P. P. Tyurin and Candidate of Technical Sciences S. M. Khazandzhiyev: "Introduction of Scientific Developments--A Powerful Lever for Development of the Sector's Technical Progress"]

[Text] Successful solution of the problems facing the sector is possible only on the basis of intensive introduction of highly effective technical developments.

In recent years gas industry attained a qualitatively new stage in its development. The annual countrywide gas yield increases were the greatest in the entire history of the sector. These achievements owe their existence to scientific-technical progress, to the development of which the VNIIGaz [All-Union Scientific Research Institute of Natural Gas] made a significant contribution. Just during the 10th Five-Year Plan the total national economic impact from introducing the results of the institute's scientific research exceeded 490 million rubles.

The beginning of the 11th Five-Year Plan has been characterized by even higher indicators for introduction of the institute's scientific developments.

Natural gas deposits such as Medvezhye, Urengoy, Orenburg, Shatlyk and others were placed into operation and are now functioning successfully on the basis of plans drawn up by the VNIIGaz.

Working together with production associations and sector scientific organizations to plan its developments and to maintain surveillance, as the parent organization, of the operation of the deposits, the VNIIGaz developed and introduced a complex of new scientific-technical concepts aimed at raising the effectiveness with which these principal deposits of the country are developed.

The VNIIGaz conducted research aimed at determining more precisely the geological structure and the possible presence of gas on the country's continental shelves and at selecting sensible directions and objects of marine geological prospecting for petroleum and gas.

The institute completed an extremely important project--evaluating the potential gas and condensate resources of the USSR, thus insuring dependable planning of sector's long-range development to the year 2000.

For the first time in Soviet practice the institute was able to arrive at the scientific-technical grounds for creating gas and chemical complexes such as those in Orenburg, Urengoy, Astrakhan and elsewhere.

Attaching special significance to development of the country's principal raw material base--West Siberia, the VNIIGaz drafted a master plan for development of the gas, condensate and petroleum resources in this region.

A system of sensible exploration of Valanginian deposits with oil-bearing margins, proposed by the VNIIGaz and introduced at the Urengoy deposit, is making it possible to reduce the number of exploratory wells by almost 60 percent in comparison with the planning data, thus significantly reducing the time of the deposit's development. Introduction of the proposal has made it possible to significantly reduce the time of the deposit's preparation for industrial exploitation; a fundamentally new scheme for locating wells offers the possibility for reducing metal expenditure by a factor of 1.5. Optimum distribution of exploratory wells and their subsequent use as producing wells are making an economic impact of more 10 million rubles possible at just the Sovetabad deposit alone.

In recent years the VNIIGaz has been conducting a great deal of research aimed at achieving stable operation of the Orenburg gas and chemical complex, it has drawn up a plan for the deposit's development during its period of constant yield, and it has prepared measures to insure stable operation of the complex in the 11th Five-Year Plan. To maintain the planned gas refining volume by the Orenburg gas and chemical complex, a plan for experimental industrial exploitation of the Karachaganak gas condensate deposit and a number of other projects were completed.

A certain proportion of the results of scientific research associated with the development of deposits was used as the basis for interdepartmental guidelines drawn up by the institute, for example the "Instructions on Accounting for Condensate Reserves of Deposits Undergoing Development."

Because the national economy requires that we increase gas extraction from deposits of eastern Turkmen SSR, an extensive volume of research was conducted at the Shatlyk deposit. An annual gas yield exceeding the planned yield was attained owing to introduction of the results of research on optimizing the production conditions of wells at this deposit.

The first experimental variants of mathematical economic models were created jointly with the Computer Center of the USSR Academy of Sciences in order to raise the effectiveness of long-range and operational predictions of gas yields in individual regions and deposits. Theoretical and experimental research was conducted on the effectiveness of different methods of increasing the yield of condensate from gas condensate deposits, a procedure for technical-economic evaluation of the effectiveness of different means of developing gas condensate deposits was created, and research was conducted on the effectiveness of a cycling process in different conditions of deposit development.

The institute's laboratories developed planning concepts to be used in designing producing wells at the largest deposits of the Soviet Union to promote their dependable operation.

Methods of preventing the crushing of casings and the consequent breakdown of producing wells have been developed and are presently being introduced at the Solenoye deposit. These methods involve the use of special plugging materials (materials which harden at low temperatures in frozen ground), the use of invert emulsion as a flushing fluid (to prevent cavern formation during drilling through frozen ground) and controlled freezing of permafrost rock located in intervals susceptible to cavern formation and having thawed out in the area around the casing. Heat-insulating casing and lift pipes that are not inferior to the best foreign models in their technical characteristics have been developed and introduced on an experimental scale.

A significant amount of work was done to introduce ejector units at the gas fields with the purpose of completely eliminating the losses of low-pressure gas. Methods and computer programs for calculating the conditions for capping gas, liquid and gas-liquid gushers and overflows were developed. Research results in this area have been used to place 17 runaway gushers under control, to include one abroad (Romania).

The VNIIGaz is providing scientific and methodological leadership to the creation and operation of underground gas storage sites in exhausted gas- and water-bearing beds.

Research on gas transportation has been concentrated on solving the pressing problems of gas industry, to include improving the procedures and technical resources of gas pipeline transport, validating optimum planning of gas transport traffic, developing measures by which to raise the effectiveness with which gas pipelines are operated in the North, developing the procedures and technical resources of transporting gas in a cooled state through long-distance, high-productivity main pipelines, and developing the procedures for liquefying and storing natural gas and returning it to a gaseous state for gas supply purposes.

The results of research on optimizing the planning parameters of main gas pipelines made it possible to justify the technical policy of gas transport for the 11th Five-Year Plan and the subsequent period.

The institute has optimized the parameters for transporting gas at a pressure of 10 MPa, and it has developed the initial requirements on the pipes and equipment needed for such gas pipelines.

Research was completed on the economic suitability of cooling transported gas down to the temperature of the surrounding air and the ground. An optimum gas cooling level was determined (8-12°C above the temperature of the surrounding air).

Research by the VNIIGaz and the experience of operating gas transport systems demonstrated the effectiveness of a procedure for compressing gas using high-pressure force pumps connected in parallel.

There are plans for initiating production of and broadly introducing high-pressure units with an exchangeable channel into practically all of the principal systems under construction. The entire series of working pressures and unit output capacities is to be achieved.

The VNIIGaz is devoting great attention to developing ways to increase the reliability of the linear sections of northern gas pipelines, and to systematically surveying their condition. Recommendations on raising the reliability and effectiveness of gas pipelines were published. The design of thermal piles equipped with a force coolant circulation system has been created and is being successfully introduced into facilities in northern Tyumen Oblast.

In the area of gas field preparation and gas refining, the institute completed and introduced a number of developments important to the sector. They include a procedure for refining gas condensate right in the area of its extraction with the purpose of obtaining diesel and other forms of motor fuels, and units for diesel fuel acquisition now operating at the Urengoy and Messo-yakhask deposits. Introduction of this new procedure solves the problem of reducing the volume of gas that must be transported and promotes reduction of losses of gas condensate. Self-contained, small condensate refining units should enjoy broad application in other gas extraction regions of the country.

A program was conducted to raise the effectiveness of the work of mass-exchange separating equipment at gas refineries.

A method of obtaining granulated pyrocarbon and hydrogen from natural and by-product gases was developed.

In the area of sulfur removal from natural gas, a unit that uses iron hydroxide solutions to remove hydrogen sulfide from gas was developed and introduced at the Sarytash deposit, and a sulfur removing procedure involving high saturation with amine solution was used for the first time in the country at the Mubarekskiy Gas Refinery. This procedure increased the unit's productivity by 30 percent and reduced relative energy consumption by 15 percent.

The institute is devoting much attention to raising the reliability of the country's Unified Gas Supply System and to its development.

The following have been developed in this direction: a long-range master plan for locating gas and chemical industry, scientific technical concepts concerned with liquefaction storage and regasification of natural gas to cover the times of peak gas consumption, concepts associated with protecting gas field equipment and gas mains from corrosion, and measures associated with high quality, efficient repair of the linear sections of pipelines. The institute created instruments to monitor the work of cathode protection stations, and they are now being used successfully. New anticorrosion materials that can be applied as pipeline insulation at the plant; new hydrogen sulfide corrosion inhibitors and corrosion- and cold-resistant steels for equipment and gas pipelines are being developed and introduced.

In order to raise the effectiveness of its scientific research the institute has created a laboratory for the planning and organization of scientific research and experimental design work and a laboratory for introduction of scientific developments. The role of these laboratories in the creation of scientific developments has grown even more, now that the institute has switched to a new system of operation based on work orders.

A large number of measures, the successful implementation of which will be a substantial contribution to hastening introduction of scientific developments into production, were approved at the institute with the purpose of raising the effectiveness of scientific research in relation to development of technical progress in gas industry.

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SCIENTIFIC-TECHNICAL DEVELOPMENTS ASSOCIATED WITH GAS PIPELINE TRANSPORT

Moscow GAZOYAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 12-13

[Article by Doctor of Technical Sciences Z. T. Galiullin and Doctor of Technical Sciences Yu. N. Vasil'yev]

[Text] Scientific research on gas transport by main pipelines is concentrated on developing more-sophisticated transportation equipment and procedures, on substantiating the grounds for optimum planning of gas transport traffic, on finding effective technical solutions to problems associated with operating gas pipelines in the conditions of the northern climate and perennial permafrost, and on the procedures and technical resources associated with transporting cooled gas over great distances.

Considering the swiftly growing rate of development of gas industry, the role of scientific research and developments concerned with improving the procedures and technical resources of gas transport by main pipelines is growing significantly. Scientific research conducted in recent years in this area pursued the following directions: increasing the diameter of gas pipelines; raising the working pressure of the gas; enlarging the unit output of gas pumping units and improving their technical-economic characteristics; unifying the plans for compressor stations and using industrial methods for their erection; cooling transported gas.

Systematic growth in the diameter of gas pipelines has made it possible for Soviet gas industry to consistently improve the technical-economic indicators of gas transport. Thus a transition to erection of gas pipelines 1,420 mm in diameter instead of 1,020 mm resulted in a 20 percent reduction of the relative metal content of gas pipelines. Attainment of the maximum gas pipeline diameter (1,420 mm) and the possibility for producing large-diameter piping with better strength properties made it possible to increase the working pressure in gas pipelines to 7.5 MPa.

Simultaneously with concentrating gas transport traffic, a technical policy of enlarging the unit output capacities of gas pumping units was implemented.

The VNIIGaz [All-Union Scientific Research Institute of Natural Gas] and sector institutes have substantiated the parameters of a number of gas pumping units--4,000, 6,000, 10,000, 16,000 and 25,000 kw--and the use of high-pressure force pumps with an exchangeable channel making it possible to optimize the type-size of compressor stations operating on gas pipelines of different diameters.

Use of this series of gas pumping units would make it possible to reduce the demand for shut-off and adjusting fittings significantly (by a factor of 1.7), to raise the load and effectiveness of the use of gas pumping units, to simplify the design of gas pumping units and to reduce capital investments into their connections (by a factor of 1.8), and to reduce labor outlays on compressor station construction (by 35 percent).

Gas pumping units with output capacities of 4,600 and 10,000 kw have been created and are now operating successfully. This includes the GPA-Ts-6.3 units. The series production of pumping units with output capacities of 16,000 and 25,000 kw is now beginning.

Intensive growth of the productivity of gas mains owing to greater diameter and working pressure has made it necessary to cool the transported gas at compressor stations.

Research by the VNIIGaz revealed the optimum levels of gas cooling: 10-15°C above air temperature in all climatic zones except in areas of perennial permafrost; from 0 to -2°C in areas in perennial permafrost.

Gas is cooled in ordinary climatic conditions in air cooling units, while special artificial cooling units have been proposed for areas of perennial permafrost.

Experimental models of air cooling units with a working pressure of 7.5 MPa and a complex of equipment for gas cooling units having a unit output capacity of 4,000 and 8,000 kw and operating on the basis of a new refrigeration cycle using a propane-butane mixture have been developed and manufactured on the basis of requirements spelled out by the VNIIGaz. This equipment is now in the testing stage.

Because of growth in the length of gas mains and the volume of transport work, measures aimed at economizing on fuel gas are acquiring special significance. The most significant results may be achieved in this regard by:

keeping the productivity of the gas pipeline at its optimum level--that is, one which would preclude forced loading of the pipeline (when productivity is raised 20 percent above optimum, energy consumption is raised by 1.6-1.7 times);

operating pumping units in parallel and using centrifugal force pumps with an exchangeable channel, which would reduce fuel outlays by 4-5 percent and relative corrected outlays on the compressor station by up to 10 percent;

developing and initiating production of new higher-efficiency gas pumping units;

replacing obsolete gas pumping units with new ones having better indicators, which would reduce fuel outlays at operating gas pipelines by 8-10 percent;

Maintaining high hydraulic effectiveness in the linear sections of pipelines by periodically cleaning the insides of the pipelines without halting gas flows; this would reduce consumption of fuel gas to 5 percent. The total effectiveness of these measures would be equivalent to saving 12-15 percent of the fuel gas.

Construction of gas pipelines in the country's north, characterized by complex engineering, geological and cryogenic conditions, necessitated a program of research aimed at developing methods of laying gas pipelines and determining the operating conditions. In this regard the VNIIGaz has developed technical concepts associated with stabilizing, reinforcing and raising the carrying capacity of soil and with restricting the thermal influence of gas pipelines upon perennial permafrost. This is achieved by using physicochemical methods of reinforcing earth, thermal piles designed by the VNIIGaz and heat-insulating shields.

Analysis and development of technical concepts associated with maintaining the reliability of gas transport has become a necessary stage in the planning of gas pipelines, since consideration of the reliability factor has a significant influence upon the normal parameters of a planned facility and all of its technical-economic indicators. The VNIIGaz and the Moscow Institute of Petrochemical and Gas Industry imeni I. M. Gubkin have developed a procedure for calculating the reliability of gas mains reflecting the present level of research on their reliability problem.

In addition to studying different aspects of basic processes (involving a pressure of 7.5 MPa), the institute is devoting a great deal of attention to developing new gas transport systems, including ones with a higher working pressure of up to 10-12 MPa.

Research has shown that raising the working pressure of gas from 7.5 to 10 MPa makes it possible to increase the optimum carrying capacity of a gas pipeline by 30 percent while leaving the rest of the technical-economic indicators practically unchanged.

Erection of gas mains operating at a pressure of 10 MPa would require development and production of an entire complex of equipment (piping, connecting parts, shut-off and regulating fittings, dust traps, separating filters, gas pumping units, new construction machines and mechanisms). A major program for creating these kinds of equipment and for their testing on special experimental industrial gas pipelines has been drawn up.

The first lot of laminated piping with a 1,420 mm diameter designed for a working pressure of 10 MPa has now been manufactured. An experimental section 4.5 km long is being built, and the planning and technical documents for an experimental industrial gas pipeline 300 km long consisting of laminated piping and two compressor stations have been developed.

Construction and introduction of these complexes into operation may be viewed as the next step in development of the procedures and technical resources of long-distance natural gas transport.

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IMPROVEMENTS SOUGHT IN GAS PIPELINE STRUCTURE, INSULATION, PROTECTION, REPAIR

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 13-14

[Article by Doctor of Technical Sciences E. M. Gutman: "Raising Reliability--a Guarantee of Effective Gas Pipeline Operation"]

[Text] Utilization of the latest achievements of the fundamental sciences, close cooperation with the sector's production organizations and coordination and specialization of scientific research and experimental design will make it possible to raise the reliability of gas pipelines, which will increase the effectiveness with which the country's Unified Gas Supply System operates.

Gas mains, the routes of which cross vast territories in different natural and climatic zones, are becoming large, expensive engineering structures, upon the reliability of which uninterrupted supply of natural gas to consumers depends in many ways.

In the effort to raise the reliability of the linear sections of gas mains, special attention is being turned to problems such as developing the scientific grounds for the structural reliability of linearly extended engineering systems, raising the quality of the piping and insulating materials employed, insuring effective operation of electrochemical protection resources and improving repair services.

In the area of gas pipeline structural reliability, the efforts of researchers are aimed at developing technical concepts which would insure trouble-free operation of linear pipeline sections in different natural and climatic conditions, creating methods and resources for evaluating the operational reliability of gas pipelines and determining the influence of the gas transport conditions on the design concepts applied to gas mains.

The VNIIGaz [All-Union Scientific Research Institute of Natural Gas] conducted technical-economic research in support of erection of gas mains out of welded multilayer piping with diameters of 1,220 and 1,420 mm intended for a working pressure of up to 12 MPa and a transported gas temperature down to -30°C . This research was the basis for creating the procedures of transporting gas through such pipelines.

Developing and introducing the methods and technical resources for monitoring the deforming stresses of operating gas pipelines was defined as the immediate task. It is being worked on jointly with organizations of the Ukrainian SSR Academy of Sciences. Completion of this task will make it possible to prevent sudden failures on gas pipelines and make prompt preventive repairs.

In an effort to stiffen requirements that would insure longer life of gas pipeline piping, instructions on the use of steel piping in petroleum and gas industry were published, and technical requirements and specifications on pipes with diameters up to 1,420 mm intended for different working pressures were clarified and corrected, and new ones were written. The specifications foresee final testing of pipe metal using the thread-breaking test--the DWTT, and 100 percent final quality control of sheet metal and welded seams by non-destructive methods.

A hydraulic stand for field-testing pipes was erected in a specialized section of the Experimental Plant of the VNIIGaz for the purposes of improving and scientifically substantiating the requirements on pipe quality and evaluating pipe performance.

One fundamentally important problem associated with the reliability of linear gas pipeline sections is that of selecting an insulating coating which would correspond to the conditions encountered along the route and to the gas transport parameters. In order to permit determination of the effectiveness of different insulating coatings within a broad range of operating conditions, the institute developed a procedure and a program of analyzing the state of insulating coatings on operating gas pipeline systems. The institute surveyed the condition of a number of gas mains, and using the results of the survey and taking account of laboratory test data, it determined the ranges of application of different kinds of coatings.

Research conducted by the insulating coatings laboratory of the VNIIGaz made it possible to develop technical requirements on adhesive insulating tape, on piping with external polyethylene and epoxy linings, on adhesive primers and on shock-resistant sheathing, and to submit these requirements to associated manufacturing ministries. The associated ministries used these technical requirements to develop new insulating materials and plant procedures for insulating piping.

Piping with an epoxy lining was introduced in collaboration with the "Sredaztransgaz," "Uraltransgaz" and "Zakaspiysktransgaz" production associations. The economic impact was 178,000 rubles in just one section of the Central Asia-Center gas pipeline. Use of piping provided with epoxy insulation at the plant can significantly raise the life of gas pipelines.

Scientific research and experimental design work concerned with electrochemical protection of gas pipelines is proceeding in two directions: sharp growth in the reliability of the resources and elements affording protection; creation of resources for continuous remote control of the work of electrochemical protection units.

Considering that creating a system for continuous remote control of the work of cathode-protection units is the priority task associated with raising the

reliability of electrochemical protection resources, the VNIIGaz developed and introduced the TKZ-2M unit for gas pipelines. This unit transmits information by the highly dependable physical pipe-earth channel.

The institute has developed and manufactured an experimental model of the UDIP-1M unit for detecting faults in insulation. The unit has been accepted by the certification commission.

In order to raise the effectiveness of electrochemical protection resources the institute proposed a protective system using widely-spaced anodes that can increase the protective zone of a single cathode-protection unit by two to four times, and to eliminate "dips" in protective potential in places of faulty insulation. This system is undergoing testing on "Soyuz" gas pipelines of the Uzbekgazprom and the Volgogradtransgaz.

About 70 percent of the fixed capital of gas mains is contained in their linear sections. In this case more than 25 percent of the total length of a network is made up of gas pipelines that have been in operation for more than 15 years. Keeping gas pipeline systems serviceable and preventing premature wear of individual structural elements is an extremely complex technical problem, solution of which requires considerable outlays.

In the area of repairing linear sections of gas mains, the institute is directing its efforts at developing a scientifically grounded repair system, at introducing progressive repair methods, such as the selective repair method, at raising the level of emergency restoration services to gas pipelines and at creating new highly productive and reliable repair resources.

Production experience has shown that it is much more difficult to repair gas pipelines than to build new ones, and that there are a number of significant unique features associated with repair equipment, procedures and job organization. Repairs require a broad assortment of specialized devices, attachments and mechanisms, and mainly small mechanized resources for excavating, cleaning and insulating jobs.

The institute and its Experimental Plant are designing and manufacturing experimental models of repair equipment. They have developed an ARS-3 pipe plasma cutting and welding field unit, and they are introducing it into the "Saratovtransgaz" Production Association. The technical documents have been written up, and individual models of small mechanized resources have been manufactured jointly with the sector's production associations. These resources include a device for removing film insulation from gas pipelines with diameters of 1,020-1,420 mm, and a device for digging beneath gas pipelines with a diameter of 1,220 mm, removing bituminous insulation from them and applying a new coat.

Many problems associated with gas pipeline repair await their solution. Working jointly with organizations of the Ministry of Gas Industry, the Ministry of Construction of Petroleum and Gas Industry Enterprises and the Ukrainian SSR Academy of Sciences, the VNIIGaz has prepared an integrated specific-purpose program for raising the reliability of the unified gas pipeline system. This program calls for scientific research on problems associated with raising the

rate of restoration of gas pipeline reliability, with reducing the rate of corrosion, with recording and monitoring the technical condition of gas pipelines, with developing new types of insulating coatings, including special repair coatings, and with reequipment of the sector's repair subdivisions.

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METHOD DESCRIBED FOR RAISING RELIABILITY OF UNDERWATER GAS PIPELINE CROSSINGS

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 23-24

[Article by P. P. Borodavkin and A. K. Bortsov, Moscow Institute of Petrochemical and Gas Industry imeni I. M. Gubkin: "'Pipe Within Pipe' Underwater Gas Pipeline Crossing"]

[Text] The experience of building and testing an experimental "pipe within pipe" gas pipeline section in which the space between the pipes is filled with cement proved this design to be highly reliable. An underwater gas pipeline crossing of this kind can be built with ease, it does not require additional ballast, and it is characterized by a high strength reserve.

When building gas main crossings over water obstacles 75 meters wide or more, Construction Norms and Regulations II-45-75 require laying a back-up strand to insure uninterrupted deliveries of gas to consumers in the event of the main strand's failure.

Redundancy does increase the probability of trouble-free operation of a gas pipeline crossing as a transport system somewhat. But this does not reduce the possibility of damage to one of the strands and the associated unfavorable effects upon the environment and losses of transported gas.

This is why it would be suitable to increase the probability of trouble-free operation of a gas pipeline crossing not by redundancy but by raising the reliability of a single-strand system. In this case the capital outlays would be significantly less than the outlays on building a back-up strand.

One of the ways of raising reliability is to build the gas pipeline as a "pipe within a pipe" and filling in the space between the pipes with cement slurry. Such an underwater gas pipeline crossing would have greater reliability, it would not require additional ballast, and it would possess a greater reserve of strength. The inner pipe is reliably protected from mechanical and corrosion damage by the outer pipe and the hardened cement in the space between the pipes.

An experimental pipeline 94 meters long was laid to work out the construction procedures and to study its strength characteristics, and it was subjected to testing.

The outer pipeline was welded out of piping with a diameter of 720 mm and a wall thickness of 11 mm. It was made from 17GS steel with a tensile strength of 520-560 MPa and a yield point of 363-373 MPa. The inner pipeline was welded out of pipes with a diameter of 530 mm and wall thickness of 8 mm. This pipe was manufactured from 14KhGS steel with a tensile strength of 495-519 MPa and a yield point of 353-392 MPa.

Coaxial alignment of the pipes was achieved by a special centering devices which were mounted on the inner pipeline at 12-meter intervals. Each centering device was assembled out of two metal half-rings with guide plates welded on.

Gate valve-equipped nozzles 50 mm in diameter were welded onto the outer pipeline to permit injection of cement slurry into the space between the pipes and to allow displacement of the air.

Before assembly of the double pipeline began, the inner pipeline was welded together and laid on supports. Then pipes making up the outer pipeline were fitted over the former from both ends and welded together.

This assembly method, in which pipes of the outer pipelines were fitted over the preassembled inner pipeline, made use of a minimum quantity of assembly equipment possible--one crane-pipelayer.

The outer and inner pipelines were subjected to hydraulic testing during construction. The inner pipeline was tested twice: The first time after assembly, for 12 hours, and the second after the double pipeline was put together, for 6 hours. The outer pipeline was tested once for 12 hours. The testing pressure was raised to a value that would cause stress in the metal of piping satisfying the minimum standard yield point of steel. A counterpressure equal to the testing pressure was created in the inner pipeline during testing of the outer pipeline.

The space between the pipes was filled with cement slurry prepared from Portland cement from the Zdolbunov plant, used to plug "cold" wells. The water-cement ratio of the slurry was 0.45, its density was 1.89 gm/cm^3 , its flow point using an AzNII penetration cone was 16.5 cm, and the transverse strength of 2-day samples of hardened cement was 2.2 MPa.

Accounting for a reserve factor of 1.05, the volume of cement slurry required to cement the space between the pipes was 16.4 m^3 . Given a reserve factor of 1.15, it took 24.5 tons of dry cement to make this volume of slurry.

The slurry was prepared in a 2SMN-20 cement mixer. Two TsA-320M cement carriers were used to inject the cement slurry and to deliver water to the mixer.

After the space between the pipes was completely filled, a slurry of lower density emerged from the nozzles first. Then its density became equal to the density of the injected slurry. At this moment the gate valves on the air displacement nozzles were closed, and excess pressure was generated in the space between the pipes. At a pressure of 1 MPa the cementing process was finished, and the gate valve on the injection nozzle was closed.

The time required to cement the space between the pipes, reckoned from the start of cement injection to the moment the gate valve on the injection nozzle was closed, was 40 minutes.

The hydraulic method, divided into three stages, was used to test the "pipe within pipe" experimental pipeline. Prior to the tests, strain gages were mounted on the outer pipeline. At the moment the tests were started (the 42d day after the cement injection) the compressive strength of hardened cement samples was 26.5 MPa.

In the first stage, the pipeline structure was subjected to preliminary testing, and its airtightness was checked. The testing pressure was 14 MPa, and testing time was 6 hours.

In the second stage long-term strength was investigated. The pipeline was subjected to 40 loading cycles with an internal pressure varying from 0 to 14 MPa. A pressure of 10 MPa was maintained in the pipeline for 216 hours.

In the third stage the structural strength of the pipeline was tested. At a pressure of 24 MPa an air release nozzle on the inner pipeline was broken away, and the entire structure lost its airtightness. After the pressure dropped, an inspection window was cut at the point of the rupture. An inspection established incomplete fusion of the seam around the nozzle as the cause of the breakdown.

In all stages the pressure was raised and lowered in steps of 1-5 MPa. Pressure was maintained at each step for 10 minutes to permit the reading of the strain gages using ISD-3 instruments. During the long-term tests on the pipeline these readings were taken every 6 hours.

Visual inspection of the cementing quality through holes cut into the outer pipeline showed that the hardened cement had completely filled the space between the pipes around the entire perimeter of the pipeline (without gaps and air bubbles).

Thus a practical example confirmed the possibility of building an underwater gas pipeline crossing with a "pipe within pipe" design in which the space between the pipes is filled with cement slurry. The tests demonstrated the high strength of such a gas pipeline. Owing to redistribution of stresses between the walls of the inner and outer pipes, the structure was able to withstand a pressure of 24 MPa without breaking down, while the inner and the outer pipelines separately could withstand a pressure of not more than 15.4 and 16.4 MPa respectively.

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METHOD FOR DETERMINING EFFECTIVE PIPELINE LENGTH PROPOSED

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 30-31

[Article by V. M. Agapkin, NIPiorgneftegazstroy (not further identified)]

[Text] Anticipatory growth of the output capacities of gas pipeline transport has become the decisive prerequisite of gas industry's dynamic development today. The scale of the program for development of the country's gas pipeline network becomes fully evident when we analyze its effective length.

In the 1970s the USSR achieved the highest rate of pipeline transport development. Since that time the length of the pipeline network has almost doubled, attaining 220,000 km.

The country's gas main network developed the most dynamically: In the last two five-year plans its length increased by 65,000 km at a stable annual growth rate of about 6,000-7,000 km.

The indicators achieved for growth in nominal length of the pipeline network attest to its growing role in the country's economy; however, this alone does not fully characterize the scale of petroleum and gas construction, and all the more so the significance of the network's growth to the fuel and energy complex.

When we analyze the dynamics behind development of the fuel supply system, we clearly discern a consistent increase in diameter of pipelines and, in recent years, growth in their working pressure.

Thus if we are to arrive at a deeper technical-economic assessment of the pipeline network and of its national economic effectiveness, it would be suitable to introduce the concept of effective length, which reflects, in addition to the nominal length of pipelines, their capacity (their throughput).

To permit measurement of effective length, a method is proposed here for reducing different pipeline parameters to standard basic values of diameter, pressure and other indicators. In terms of its form, this method is to a significant extent similar to the use of indicators such as "ton of comparison

fuel," "equivalent square meter of radiator and convector area" and others commonly employed in statistical reporting.

Indicators attained at the beginning of the accounting period or other values which most fully describe present development of equipment and production processes may be adopted as the basic values for pipeline network parameters. Thus a diameter of 1,000 mm can be adopted for a gas pipeline network and a diameter of not more than 700 mm can be adopted for a petroleum pipeline as basic values.

To correct the parameters of different pipelines to the basic values, we use coefficients characterizing the throughput of the gas pipeline of a given diameter (D_i) and pressure (p_j) in relation to the throughput of a gas pipeline with the basic diameter (D_0) and pressure (p_0) under otherwise equal conditions (identical spacing of compressor stations, identical temperature of pumped gas etc.).

Using the equality of the cargo turnover of the real and equivalent pipeline networks, and basing the calculations on known relationships of gas dynamics, we can determine the effective length using the formula

$$l_3 = \sum_{i=1}^n \sum_{j=1}^m k_i k_j l_{i,j},$$

where $l_{i,j}$ -- nominal length of gas pipelines with diameter D_i and pressure p_j ;
 $k_i = \left(\frac{D_i}{D_0}\right)^{2,6}$; $k_j = \frac{p_i}{p_0}$ -- coefficient for reducing correspondingly to the basic diameter D_0 and basic pressure p_0 ; n -- number of different diameters in the gas main network; m -- number of different working pressures in the gas main network.

The reduction coefficients for gas pipelines of different diameters are given in Table 1.

Table 1

Diameter, mm	Working Pressure, MPa	Coefficient for reducing to a basic pressure of 5.6 MPa and basic diameter of (mm)	
		700	1000
500	4,6	0,417	0,165
	7,5	0,558	0,221
600	5,6	0,670	0,265
	7,5	0,897	0,355
700	5,6	1,000	0,396
	7,5	1,339	0,530
800	5,6	1,415	0,560
	7,5	1,895	0,750
1000	5,6	2,528	1,000
	7,5	3,386	1,339
1200	5,6	4,061	1,607
	7,5	5,439	2,152
1400	5,6	6,063	2,399
	7,5	8,120	3,212

Table 2

<u>Year</u>	<u>Gas pipeline network length, 1,000 km</u>	
	<u>actual</u>	<u>effective</u>
1970	67.5	67.5
1975	98.7	145.8
1980	132.7	254.1

Statistics on the length of gas pipelines of different diameters were used as a basis for calculating the effective length of the USSR's gas pipeline network in the period since 1960. The results showed that under the influence of technical progress in gas transport, the rate of growth of the effective length was 1.2-2 times greater than the rate of increase of the nominal length of the gas pipeline network. In this case beginning with the mid-1960s there was a noticeable discontinuity in the curve representing growth in effective length, elicited by a transition to mass construction of large-diameter pipelines. As a result of reconstruction of the gas pipeline network, by 1967 its cargo turnover became equivalent to that of a network of the same length made of pipes with a diameter of 700 mm. The equivalent diameter has now approached 1,000 mm.

In the 1970s the effective length of the gas pipeline network, when reduced to the mean basic diameter and to other basic technological indicators of the 1970 level, increased by a factor of 3.8 to 254,000 km. (Table 2).

The effective length of the pipeline network, to include pipelines carrying petroleum and petroleum products, increased almost fourfold in this case, approaching 390,000 km.

As a result the rate of development of pipeline transport during this period exceeded the rate of development of other transport sectors, and the proportion of the cargo turnover carried by the pipeline network with respect to total turnover increased by a factor of 2.5, while the proportion of other forms of transport (with the exception of motor transport) decreased. In terms of cargo turnover, pipeline transport took second place in the world, handling 70 percent of all fuel transport.

In the USA, the length of pipelines built in the 1970s is 120,400 km, but the effective length (using the dimensions applied to the Soviet Union's pipeline network) is estimated at only 58,600 km, which is less than a 3-year program of pipeline introduction in the USSR (Table 3).

This difference stems from the USA's orientation toward erection of distributing pipelines of small diameters, coupled with a relatively low proportion of mains intended for large flows of petroleum and gas. In the USSR, petroleum and gas transport proceeds with more-intensive and economical parameters than in the USA.

An analysis showed that the gas pipeline construction volume for the 10th Five-Year Plan, evaluated on the basis of the final national economic result,

Table 3

Year	Pipeline network length, 1,000 km			
	USSR		USA	
	actual	effective	actual	effective
1970-1975	50.3	131.1	65.6	30.3
1975-1980	54.1	151.5	54.8	28.3
1970-1980	104.4	282.6	120.4	58.6

was 70 percent in relation to the effective length of the entire gas pipeline network at the beginning of 1975, though growth in work volume in actual units (kilometers of introduced gas pipelines) was less than 35 percent. Consequently if we are to validly evaluate labor productivity in pipeline construction, we would have to calculate it with regard to qualitative progressive changes occurring in the equipment of and procedures employed by gas main transport--that is, we would have to use the effective length indicator as the basis. The corresponding calculations revealed that improvements in the parameters of the erected pipelines had a decisive effect on labor productivity in pipeline construction. This direction of scientific-technical progress, combined with technical progress in construction itself, made up the basis for a unified technical policy of pipeline construction and promoted higher labor productivity.

Concurrently, progressive changes occurring in the structure of the pipeline network promoted almost a doubling of labor productivity in pipeline operation. Had the transportation needs of the 9th and 10th five-year plans been met by construction of gas pipeline networks with technical-economic indicators of the 1970 level, gas industry would have required an extra 45,000 workers.

Use of the effective length indicator has changed our idea concerning relative outlays of financial and material resources, and it has revealed the progressive influence of technical progress upon the dynamics of these indicators. For example transition to erection of gas pipelines with a diameter of 1,420 mm and a pressure of 7.5 MPa in place of gas pipelines with a diameter of 1,020 mm and a pressure of 5.6 MPa promoted a metal savings that has now attained 2 million tons.

Thus the main pipeline effective length indicator allows us to subject a pipeline network to technical-economic analysis and predict its development on the basis of not only the nominal length of the network but also its capacity (turnover). A possibility arises for comparing the level of development of gas pipeline systems in different regions and countries differing in structure and parameters.

It appears suitable to use these indicators to analyze labor productivity and the output-capital ratio in construction, as well as to determine the effectiveness of capital investments into gas industry.

The author expresses his gratefulness to Doctor of Economic Sciences B. S. Vaynshtein, upon whose initiative and with whose participation this article was prepared.

METHOD PROPOSED FOR PLUGGING GAS LEAKS

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 31-32

[Article by G. V. Voronin, Sredaztransgaz (not further identified): "Plugging Gas Leaks Without Shutting Down a Gas Pipeline"]

[Text] The method proposed here for carrying out open-flame jobs to plug gas leaks in the valve fittings of blow-off pipes of gas mains and compressor stations without shutting down the gas transport equipment can reduce gas losses and insure uninterrupted gas transport.

With time, small gas leaks from leaky cocks on gas mains tend to increase owing to erosion of the sealed surfaces. Such leaks are usually corrected by installing an additional cock. When gas leakage is significant, this work requires that the particular section of the gas main be shut down, and that the gas be depressurized. However, shut-down of a section of a gas pipeline with a diameter of 1,420 mm and a working pressure of 7.5 MPa involves significant losses of gas and interruptions in supply. This is why we have proposed a method of plugging gas leaks in blow-off pipe cocks with a diameter of 300-400 mm not requiring shut-down of the gas pipeline and depressurization of the gas.

A hole can be cut for an additional cock at an excess pressure of up to 2-5 Pa on the "lower" side of the blow-off pipe cock. For this purpose the blow-off pipes are first purged to remove liquid and contaminants from the horizontal pipe section. Then a sufficiently spacious pit with gently sloping sides is dug to improve natural ventilation and permit free access to the work zone. Pressure inside the pipe is determined by drilling a 6-8 mm diameter hole at the proposed cutting point. Absence of liquid is checked, and pressure is measured with a U-shaped pressure gauge. The work procedure is diagramed in Figure 1.

Two catheads 300-500 mm long are welded to the cock to be installed. In the pit, the pipe is cleaned of its insulation, and all remnants of insulating materials are removed. Fire extinguishing resources and personal protective resources are prepared.

A 100×150 mm patching hole 5 (Figure 1) is cut out of the top of the horizontal section of the pipe 1.5-2 meters from the place where the additional cock is

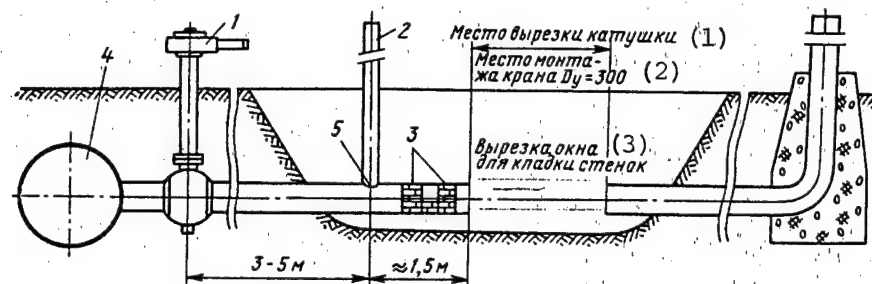


Figure 1. Diagram of the Procedure for Installing an Additional Cock on a Blow-Off Pipe Connector: 1--Leaky blow-off pipe valve; 2--blow-off pipe for diversion of leaking gas; 3--adobe wall; 4--gas main; 5--patching hole.

Key:

1. Point of cathead cut-out
2. Point of installation of Du-300 cock
3. Access hole for laying of adobe wall

to be installed. Clay mortar is applied to the cutting location, after which the patch is removed. An additional blow-off pipe 2 with a diameter of 159 mm and a height of 3-3.5 meters is installed over the cut hole. The fitted end of the blow-off pipe is trimmed to a minimum gap (similarly as with fitting a T-branch). The blow-off pipe is arc-welded to the main pipe, the diameter of which is 325 or 426 mm, and it is dependably secured in vertical position. The gaps between the additional blow-off pipe and the connector pipe are sealed with thick clay mortar. At the place where the additional cock is to be installed, a hole with approximately 250×400 mm dimensions is cut out.

A wall 3 consisting of adobe or of sovelit tiles on clay mortar is built inside the pipe using the cut-out for access. The gaps in the wall are filled with mortar, and the completed wall is plastered. To improve gas-tightness and increase resistance to cracking due to drying, a second wall is installed.

If the excess pressure is high, the second wall is installed 150 mm from the first, and a drain pipe with a diameter of 57 mm is installed between them.

Removal of the cathead and installation of an additional cock do not elicit any special difficulties. Attention should be turned in this case to possible ignition of gas inside the pipe on the side on which the cock is to be installed. To avoid this, before welding on the cock both of its sides should be carefully centered, and the surface of the pipe and the cock should be cooled as the joints are welded.

Before welding down the patch, blow-off pipe 2 is removed, and the gas-resistant walls inside the pipe are broken down with a flexible metal rod through the open hole. The patch is welded on using a backing ring. If excess gas pressure beneath the patch is great and welding cannot be carried out, the material of the gas-resistant walls is purged by opening the blow-off pipe cock for a short moment. Before purging, the prepared patch is fitted in the hole and pressed down by a special device (Figure 2).

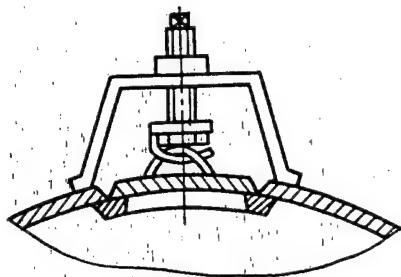


Figure 2. Patch Clamping Device

If in this case good welding is impossible, a 159 mm diameter blow-off pipe equipped with a Du-150 cock is installed over the patch, the lower end of the pipe is fitted to the 325 mm pipe, and a T-branch with a reinforcing collar is made. After the job is completed, the Du-300 and Du-150 cocks are installed and shut.

The method described above was used to install five additional Du-300 cocks into blow-off pipe connectors in Sredaztransgaz, including three on the Central Asia-Center gas pipeline with a working pressure of 7.5 MPa. An additional cock was similarly installed on a Du-500 connector between the first and second strands of a gas pipeline during temporary shut-down of one of them to replace a line cock unit.

The largest gas leak that was eliminated was on a safety cock of the Akchalok compressor station, which operates at an excess pressure of 1.8 Pa.

The work of installing additional cocks reveals that stopping large leaks is more complex and laborious than stopping small leaks. Considering the progressive nature of gas leakage through ball valves due to erosion of the valve and gasket, additional cocks should be installed as soon as possible after leaks are discovered. This would also help to reduce gas losses.

Efforts to stop leaks in blow-off pipe cocks reduced gas losses by 60-80 million m^3 per year.

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PROCEDURE OPTIMIZES ANNUAL GAS EXTRACTION LEVELS

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 10, Oct 82 pp 24-26

[Article by O. F. Andreyev, G. A. Zotov, Yu. A. Peremyshtsev and S. V. Sheykin, All-Union Scientific Research Institute of Natural Gas]

[Text] The proposed procedure for optimizing annual extraction from a group of gas fields can be used as a basis for an optimum deposit development plan drawn up in coordination with the country's fuel and energy balance.

Optimizing the annual gas extraction levels for a group of deposits is a complex problem requiring solution of a nonlinear system of high-dimension equations describing interaction of economic and production processes in a multi-level developing system.

The complexity of the problem also lies in the fact that natural gas is used in different sectors of the country's national economy, and it is imported into foreign countries. On the other hand the finite nature of natural gas resources, the significant share they contribute to the country's fuel and energy balance, and the great capital outlays and metal consumption required by long-distance gas transport make it necessary to sensibly distribute the gas yields among gas extraction regions with the purpose of mandatorily insuring an adequate extraction volume over a long period of time, after which natural gas will have to be replaced by an alternative fuel-energy source.

We can derive a general scheme of calculations that would have to be completed to arrive at the technical-economic grounds for particular extraction volumes for a region and for individual deposits. Realization of this scheme with a computer would require that we create a cumbersome nonlinear mathematical economic model. Moreover a number of issues associated with rough planning of the infrastructure of gas extraction have not yet been studied sufficiently enough for mathematical economic modeling. Another known difficulty associated with technical-economic evaluations is the absence of scientifically grounded dynamic standards valid over the long range.

In the first stage, the problem can be stated in the following way. Using an existing plan for long-range gas extraction in the region (it need not be optimum in the general case), we establish the optimum annual gas extraction

levels for the deposits, the priority for development of which is determined by expert assesment.

Considering the end goal--drawing up scientifically grounded plans for development of gas deposits that are to be corrected and coordinated by a group of experts, we can use both composition and decomposition mathematical economic models. [1,2].

This article presents one of the variants of building a composition mathematical economic model applicable to the West Siberian gas extraction region (the Senoman complex). The problem was solved in two stages. In the first stage the group of deposits was simulated by a conditional "regional" deposit characterized by equivalent reserves, identical production processes, averaged thermobaric characteristics and average regionwide technical-economic standards. The following assumptions and limitations were adopted for this purpose.

1. The assumption of similarity of production processes, or the law of constancy of relative outlays irrespective of the scale of production (gas extraction)--that is, when extraction grows by a factor of n , the outlays increase by the same factor. We may assume as an approximation that this relationship would hold if instead of a group of deposits we examined a single "regional" deposit with total reserves equal to the sum of the gas reserves of the group of deposits, and that the mean reservoir pressure is equal to the weighted average for the entire interstitial volume.

This schematic representation of a gas extraction unit is tailored to the conditions of West Siberia because the principal industrial gas reserves are concentrated in a Senoman productive complex having approximately identical thermobaric characteristics.

2. The assumption of additiveness of gas extraction processes. In other words if yield (event) X_1 is possible with outlays Y_1 , then event (X_1+X_2) would be technologically possible with outlays (Y_1+Y_2) .

Calculations conducted in relation to different gas deposits of the region revealed relative stability of optimization parameters such as the yield and the diameter of the gas-lift shaft. Therefore these parameters were adopted as constant for the regional model with variable reserves. As a first approximation, this assumption may be justified because the Senoman productive horizon of northern gas deposits is characterized by homogeneous structure and good reservoir properties insuring stable yields from gas-lift shafts of identical design.

The operating conditions determined by the Senoman gas deposits and the wells are homogeneous. Therefore, given identical gas-lift shaft design and identical yields, production parameters such as the number of producing wells and the output capacity of booster compression stations would also have the additiveness property in the "regional" model. Calculations show that the national economic impact, evaluated on the basis of a regional quasihomogeneous model differs by no more than 10 percent from the total impacts from development of a group of deposits for which calculations are made separately.

3. The planning strategy--that is, the rate of development and the dynamics of the growing yield for the region--is assumed to be known. It is assumed that it has been optimized with regard to development of the entire sector.

$$\text{Then } Q_{r.p} = \sum_{i=1}^n Q_i$$

where $Q_{r.p}$ -- annual yield from the region; Q_i -- annual yield from a single deposit.

This model was used to determine optimum production indicators for development depending on the gas reserves.

Maximum national impact--the discounted difference, expressed in terms of cost, between the amount realized and the outlays on development--was used as the optimum criterion. In this case the outlays on transport of the gas by main pipelines were considered integrally. The cost estimate for the gas was determined from the total outlays less the average transportation factor. In subsequent years its value was adopted as variable, increasing linearly, since total outlays tend to increase over the long range.

The technical-economic calculations did not account for outlays on the infrastructure of gas extraction and on geological exploration, and limitations were not imposed on capital outlays.

Use of the maximum national economic impact made it possible to compare developmental variants exhibiting different dynamics of annual extraction. In this case the different variants were equalized in relation to the total extracted product over the entire period of development, including the time of diminishing yield.

The mathematical problem can be formulated as follows.

Find $\max W_3 = \max \{x, y, z, g, v, q\}$, where W_3 -- maximum national economic impact; $x \in X$ -- yield; $y \in Y$ -- annual gas extraction; $z \in Z$ -- diameter of gas-lift shaft; $g \in G$ -- intensity of development, defined as $g = dq/dt$; $q \in Q$ -- gas extraction during the period of constant yield; $v \in V$ -- gas reserves.

Approximate solution of this problem is proposed (using the variant sorting method). An iteration algorithm developed for this purpose [3] was run in FORTRAN-IV language. The calculation time using a YeS-1033 computer is 4-5 hours. The number of developmental variants evaluated is on the order of 2,500.

Structurally the algorithm consists of individual blocks for calculation of production and technical economic indicators. The results of the developmental variant for fixed gas reserves, optimized in relation to national economic impact, are printed out.

Analysis of the results of discrete computer calculation showed that W_3 has rather distinct extreme points in relation to variable parameters: yield, diameter of the gas-lift shaft, extraction volume during the time of constant extraction, and the annual gas yield from the deposit. However, the absolute

difference of the impacts is not great near the extreme points. Considering the accuracy of the raw data and the interval of the discrete calculations, we can determine the optimum zone for the region. The optimum annual yield from deposits containing fixed reserves (or the percentage of gas extraction from the reserves) tends toward a natural limit in terms of production parameters, and it best serves as a characteristic of the deposit's extraction possibilities. As a rule this technological limitation makes further operation with constant or increasing annual gas extraction impossible owing to dramatically increasing hydraulic losses in the reservoir-well-piping system.

The dependence of national economic impact upon reserves does not have extreme points; instead, it exhibits a tendency toward growth with increasing gas reserves.

This behavior of the national economic impact criterion can be explained on one hand by idealization of the initial model, which does not account for various technical-economic factors (flooding of deposits and redrilling of producing wells, use of low-pressure gas, the trends and structure of prices set on fixed capital and of production processes over the long range etc.), and on the other hand by the major role played here by the ratio of the different outlays that are added together. It is known that in the Far North, the main capital outlays are associated with producing wells, gas field pipelines and roads.

This empirical dependence is approximated with respect to the limits of change in reserves under analysis here using the formula

$$P = 8 \cdot 10^{-3} Q_{r.p} \exp \left[-\xi V_n + \frac{1}{4} (\xi V_n)^2 \right], \quad (1)$$

where P --ratio of annual extraction to initial gas reserves; V_n --gas reserves; $\xi=0.04$ --empirical coefficient; $Q_{r.p}$ --planned extraction in the region.

Dependence (1) is integral in nature, and it would be incorrect to use it as it stands to determine extraction from different deposits. This is why a procedure entailing the use of dependence (1) in relation to a group of deposits with a given total extraction volume $Q_{r.p}$ and a given sequence of development of the deposits was developed in the second stage of the research. The algorithm for determining annual extraction from deposits developed in a particular sequence reduces to the following. P is determined for the first deposit using formula (1), in which V_n is taken to represent the gas reserves of this deposit. Another formula is used for the subsequent deposits:

$$q_j = \left[P_j V_j - (P_{j-1} - P_j) \sum_{i=1}^{j-1} V_i \right], \quad (2)$$

where q_j --annual gas extraction from j -th deposit ($j=2, 3, \dots, n$),

$$P_j = \frac{q_j}{\sum_{i=1}^j V_i},$$

in this case $V_n = \sum_{i=1}^j V_i$ (determined by formula (1)); $P_{j-1} = \frac{q_{j-1}}{\sum_{i=1}^{j-1} V_i}$, in this

case $V_n = \sum_{i=1}^{j-1} V_i$ (determined by formula (1)); V_j --gas reserves of j -th deposit.

In principle, this algorithm makes it possible to play out different variants of the developmental strategy--that is, the variants may be checked out in relation to a broad range of values for annual gas extraction from the first deposit (variation of P_1), and the best variant can be selected on the basis of the national economic impact results.

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COAL

CEMA COOPERATION FOR AUTOMATION OF COAL INDUSTRY DISCUSSED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 8, 1982 pp 31-34

[Article by Boris Ignat'yev and Mark Burshteyn, coordination center "InterASUgol": "Scientific and Technical Cooperation Among CEMA Countries for Creation and Introduction of an Automated Control System in the Coal Industry"]

[Text] In attributing great importance to improving control of the coal industry under conditions of functioning of an automatic control system, the appropriate ministries of the CEMA countries in April 1975 concluded an agreement about scientific-technical cooperation on the problem "Creation and Introduction of an Automated Control System in the Coal Industry." The parties made a decision to cooperate on a unified coordinated program, mainly on a multilateral basis.

One of the first operations stipulated by the program was the development of national and summary reports. On the basis of this information, a number of questions were defined which were important for each country. This made it possible to pinpoint the program and to compile working plans. The materials contained in the reports determine the composition and content of the most important work on the problem in the direction of unity of technical, information, mathematical and other types of support of the ASC [automated control system] in the cooperating countries. The pinpointed program and the plans for cooperation in correlation with the work plans of the permanent commission of the CEMA for cooperation in the area of the coal industry were discussed and considered at the 48th and 53rd meetings of the commission.

The program stipulates continuation of cooperation in 1981-1985 and contains three directions: "General-System Questions of Automating Control," "Automated System of Economic Control," and "Automated Control of Production and Economic Activity of Enterprises."

Within the framework of the first direction, all the countries have introduced and are using the results of work on the topic "Development of Multilanguage Terminological Dictionary for the ACS in the Coal Industry" (coordinating countries Polish People's Republic, USSR and CSSR, participating countries

People's Republic of Bulgaria, Hungarian People's Republic, GDR and Socialist Republic of Romania). This work promotes overcoming of terminological and language barrier between the specialists of the cooperating countries. The dictionary consists of seven volumes and contains over six thousand terms with a concise content explanation in Russian and equivalent concept in English, Bulgarian, Hungarian, German, Polish, Romanian and Czech.

The results of the joint development of the topic "Predicting the Development of Automated Control Systems and Basic Trends of Cooperation" (coordinating country USSR, participating countries People's Republic of Bulgaria, Hungarian People's Republic, GDR, Polish People's Republic, CSSR) were used by the countries to analyze the basic national trends of development of the ACS in the coal industry for the future. In addition, the collective expert evaluation made with the participation of all parties revealed subject areas of automation for the functions of control in which the countries are the most interested, and made it possible to provide a substantiated analysis of the direction for cooperation of the problem, as well as to develop a program and plan for cooperation for 1981-1985.

The following topic can be presented as an example of the development of joint methodological materials: "Systems of Information Support of Different Levels of Control of the Coal Industry under conditions of ACS" (coordinating country USSR, participating countries People's Republic of Bulgaria, Hungarian People's Republic, GDR, Polish People's Republic, Socialist Republic of Romania and CSSR), whose main trend is general-system methodological questions determining the successful construction of information systems. During the joint studies, a unified approach was selected for constructing a data base: structure, principle of "subject regions" and links between them. The collectively developed method materials made it possible to obtain specific techniques for constructing structures of the data base, and also to describe the indicators introduced into the base. All of this guarantees more effective realization of the control functions at different levels and in different links of the control apparatus of the coal industry.

Individual topics covered the regulation of mutual exchange of information within the framework of the problem. Thus a catalogue of technical resources of ACS in four volumes was developed and published (coordinating countries USSR, CSSR, participating countries People's Republic of Bulgaria, Hungarian People's Republic, Polish People's Republic and Socialist Republic of Romania). It was distributed to the national scientific research and planning-design institutes of the sector and is widely used by specialists in the region of ACS and ACS of the technological process for orders of equipment and in designing systems of control for different hierarchical levels.

For the purpose of informing the specialists about modern developments in the field of solving tasks of control, the cooperating countries have compiled and issued a catalogue of algorithms and programs which it is planned to periodically supplement and update.

The second direction of the program stipulates the solution of tasks of automating the functions of economic control at different levels. The form of completion of work in this direction is different stages of development or introduction of technical documents according to the national potentialities of using it as applied to specific tasks of control.

The method base for the realization of this work is the module principle which stipulates the breaking down of topics into local modules (blocks) suitable for use to a certain degree in the interested countries.

An example of using the module principle is development of the topic "Control of Maintenance, Repair and Reliability of Equipment for Mines, Quarries and Enrichment Plants at the Levels of the Sector, Association and Enterprise (Included in the Association)" (coordinating country USSR, participating countries People's Republic of Bulgaria, Hungarian People's Republic, Polish People's Republic, Socialist Republic of Romania and CSSR). This topic was subdivided into six subtopics. The subtopic "Planning, Calculation and Analysis of Major Repair was conducted by the coordinator Hungary, "Calculation and Analysis of Work and Idling of Coal Mine Equipment" and "Planning and Calculation of Consumption of Spare Parts" by the Hungarian People's Republic, "Planning of Maintenance and Repair of Equipment" "Calculation and Analysis of the Use of Equipment" by the USSR, "Planning of Demand for Mining Equipment" by the CSSR. Technical drafts for subtopics were developed by countries with regard for the possibility of their use by the interested parties in a working design.

During realization of the measures, a decision was adopted for the Polish People's Republic and the USSR to develop a unified draft of an integrated system for a unified computer system based on the Polish system I-EAD. This draft outlines the use of technical documents for the system of planning maintenance and repair of equipment developed by the specialists of the USSR.

In addition, the specialists of the People's Republic of Bulgaria and the CSSR have currently completed preparation of the corresponding technical drafts, on whose basis fulfillment of the working drafts on a contract level is outlined.

The module principle has also been used in fulfilling the topic "Solution to the Tasks of Worker and Supervisory Cadres" (coordinating countries CSSR, participating countries Hungarian People's Republic, Polish People's Republic and USSR). The distribution of work accelerated and facilitated the possibility of solving in the countries a broad set of personnel tasks. The large volume of work done made it possible to prepare a scientific stockpile for further solution to the set of tasks associated with a number of questions of controlling the worker cadres, including sociological.

On the topic "Set of Tasks of Controlling Material and Technical Resources (MTR) on the Level of the Sector and Association" (coordinating country USSR, participating countries People's Republic of Bulgaria, Hungarian People's Republic and Polish People's Republic) a unified technical draft was developed with regard for the requirements of the cooperating countries. Thus, it was possible in the People's Republic of Bulgaria to use the systems of servicing the data base included in this draft. The Polish People's Republic used information on systems solutions in the area of MTR operating in other countries. Familiarization with systems functioning in the USSR, the

computer system with the use of a data base and operational systems was especially important for the Polish party. In the USSR, generalization of the obtained materials made it possible to develop common tasks which resulted in the realization of universal systems of information processing and introduction of tasks of controlling the MTR in the coal industry.

On the topic "Development of Tasks of Current and Long-Term Planning on the Level of the Production Association, Sector" (coordinating country CSSR, participating countries People's Republic of Bulgaria and USSR) the parties came to method unity. On this basis, method materials were developed and agreed upon which made it possible to distribute work between the countries on a mutually supplementing principle. In the USSR, the specialists who are developing an algorithm to calculate the control assignment for coal extraction in open pits used the technique in determining production output of active ore fields for coal extraction by underground and open-pit methods obtained from the People's Republic of Bulgaria. The specialists who prepared a model for annual planning of coal reprocessing at the enrichment plants of the USSR Ministry of the Coal Industry used a number of correlations between technical and economic indicators taken from the working materials on the model of planning production for coke-chemical enterprises obtained from the CSSR.

The CSSR specialists have done probation work on this topic in the USSR where in cooperation with the USSR specialists they verified in practice some procedures and methods used to develop a specific model. This created favorable conditions for the use of the Soviet experience in the CSSR. A specific result was the development of a model for obtaining coke at coking plants of the concern LKD which completely used the experience acquired during realization of this topic. The model was tested and is now used to compile a plan.

Expansion in deepening of cooperation on the problem made it possible to conclude a number of bilateral contracts for fulfillment of specific work. Thus, the People's Republic of Bulgaria and the USSR concluded a contract on the topic "Development of Automated System for Controlling Mine Construction." The Soviet party is fulfilling the first stage of work associated with economic set-up of the task. The Bulgarian side will fulfill the next stage of working out the special program for solving the task on the unified computer system. This distribution of work allows both parties to reduce labor outlays and to converge the time for industrial introduction of the results.

Development of program support for a set of tasks on the topic "Formation of an Annual Program of Construction-Installation Work of the Association" has currently been completed on this contract. Its experimental operation under specific conditions has been conducted; in the People's Republic of Bulgaria at the combine in Dimitrovgrad and in the USSR at the combine "Rostovshakhtstroy." Joint development of technical documents has been completed for a set of tasks on the topic "Formation of Daily Schedules for Shipping Construction Freight." Experimental operation of this set will be conducted in the USSR at the combine "Pechorshakhtstroy." Further development of sets of tasks is outlined for formation by the construction organizations of quarterly and monthly orders for material resources, quarterly and monthly schedules for production of construction-installation work etc.

Within the framework of the third direction, work is being done to automate functions of control at the level of the enterprise (mines, open pits, enrichment plants, repair plants).

On the topic "Automation of Production Control at Mines" (coordinating country Polish People's Republic, participating countries People's Republic of Bulgaria, Hungarian People's Republic, Socialist Republic of Romainia, USSR and CSSR) the cooperating countries have given to their partners technical documents which they use in solving specific tasks of control. The coordinating country gave to the other countries data on evaluation of materials obtained from the USSR and CSSR, as well as technical documents which could be the object of export or exchange. In the CSSR, with regard for the experience of other countries, an automated control system was developed and realized for deep mines in a number of subsystems which is being successfully used at the mine "Starzhich." This active automated control system can be used by other countries as well under conditions of its acquisition on a contract basis.

On the topic "Automation of Control of Production at Coal Enrichment Plants" (coordinating country Polish People's Republic, participating country USSR; from 1975 to 1980 the CSSR also participated) in 1980 the countries were given algorithms developed in the USSR to calculate the fractional composition of coal with the minimum volume of input information. Using these algorithms the CSSR developed programs which were suitable for realization under conditions of the Ostrava-Karvina basin. The algorithms prepared in the Polish People's Republic for controlling the quality parameters of enrichment products by the Polish specialists at their enrichment plants were tested and transferred to the scientific research institutes of the USSR and CSSR to determine the areas of their application concerning the available national technical monitoring resources.

On the topic "Automation of Production Control at Open Pits" (coordinator GDR, participating countries People's Republic of Bulgaria, Hungarian People's Republic, Polish People's Republic, USSR and CSSR) the cooperating countries exchanged technical documents which are being used by the partners on national developments. For example, the Soviet party gave to the participating countries for solution a question of the possible use of information materials on the apparatus of transmission on a radio channel of digital rapid information (API-2 "Infra"), a set of equipment of the control station of the mining dispatcher of an open pit (Ritm-1"), as well as for different apparatus of control and calculation of the operation of equipment at open pits etc. A number of countries have contracted on bilateral cooperation for individual questions of the topic. Thus, the statement of the tasks "Planning and Distribution of Stock Between Open Pits" corrected by the specialists of the USSR and CSSR (initially developed in the USSR) made it possible to significantly expand the area of its dissemination. The information obtained by the Soviet specialists from the CSSR regarding the content and structure of the geological data base of the open pit reduced the periods for creation of geological data bases for planning and control of mining operations in the USSR.

The economic effectiveness of cooperation is calculated according to the method conclusions adopted by the council of representatives which take into consideration the specific nature of the problem. Its feature is that the final result of work is technical documents, technique, algorithms, programs, and not a product in the form of equipment, instruments or other finished items or materials.

According to these method conclusions, the economic effectiveness of cooperation is expressed by two indicators:

economy from reducing labor outlays for development of technical resources, algorithms, computer programs and other types of technical documents (sphere of science);

economy from early introduction of technical solutions at enterprises and organizations (sphere of production and control).

The economic effect is obtained by division of labor, i.e., fulfillment by each cooperating country of only part of the work to solve a common technical problem and the use by the cooperating countries of the finished technical solutions developed by one of the countries.

The total economic effect of all the cooperating countries in the examined period of work in the sphere of science can be evaluated by conservation of labor of 180-200 scientific workers. In addition, one should bear in mind the indirect economic effect from introducing tasks of control using the ACS consisting of an improvement in the quality level of the adopted solutions in the corresponding links of the control apparatus.

In characterizing the results of cooperation for creation and introduction of ACS in the coal industry, it is possible to draw definite conclusions. In 1975-1977, cooperation mainly had an information nature which permitted in the subsequent years (1978-1979) an increase in its intensity and a transition to more effective forms based on division of labor with regard for the interest of the parties. The introduction of the obtained results in the countries essentially only started in 1979. Despite this, a real saving from cooperation in 1975-1980 was obtained in all countries.

Cooperation fostered a convergence of the method procedures, as well as technical and scientific directions in questions of developing automated systems of control in the coal industry. Currently, improvement in control in the coal industry is mainly being done under conditions of using the unified computer system or switching to these machines which foster further development and deepening of cooperation.

During the realization of the program, it was possible for the cooperating countries to use the leading experience, and also consider the errors allowed in the creation and introduction of the ACS. This permitted each country to improve the national scientific and technical level of the ACS and promoted a balancing of their potential in this area.

Multilateral cooperation implemented in the framework of the coordination center "InterASUgol'" during realization of the program completely justified itself and made it possible to obtain a definite economic effect.

For further development of cooperation on the examined problem it is necessary to continue the implementation of a technical policy to converge scientific and technical directions of development of ACS in the coal industry of the cooperating countries, including for the basic types of support of the ACS-technical, program and information. One should strengthen attention towards unity of the procedures in solving tasks of control for different links and levels of apparatus of control under conditions of the ACS, and to improve the organizational fundamentals of cooperation on the problem, by mainly using the advantages of multilateral cooperation.

During the work it is necessary to make broader use of the contract form of cooperation.. It is necessary to enhance the economic effectiveness of cooperation, primarily through introducing finished work in the sphere of production, and the quality of work by improving the performer discipline and coordination of work. An important method of cooperation is solution to the question of more complete provision of the ACS of the fuel industry created in the countries with the basic technical resources (including the necessary sensors and other small-series equipment of automation).

One should note that during cooperation, correlation and coordination of work done in the framework of the coordination center "InterASUgol'," were implemented with agencies of the permanent commission of the CEMA for cooperation in the field of the coal industry. In this case great method and practical help to the coordinating center was given by the sector of the coal industry of the CEMA secretariat. At the meeting of the commission, information was regularly heard from the coordination center about the course of realization of the program of cooperation and the appropriate decisions were made for further direction of the work.

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COAL

ADMINISTRATIVE CENTRALIZATION OF COAL INDUSTRY PRODUCES NEW PROBLEMS

Moscow PLANOVYE KHOZYAYSTVO in Russian No 10, Oct 82 pp 79-83

[Article by Candidate of Economic Sciences I. Bogurayev: "Problems of Improving the Sector's Administration"]

[Text] Throughout the entire history of our state's development, improvement of the forms and methods of administering the country's socialist economy has been an object of continual concern on the part of the party and government. Focusing attention on these issues, L. I. Brezhnev said at the 26th CPSU Congress that "the solution to the problems facing us and utilization of the possibilities we possess depend in many ways on the level of the national economy's management, on the level of planning and administration."*

Major steps have been taken in last few years in coal industry to improve the structure of the sector's administration. In the period following 1974 a two and three unit master plan of production control was developed and basically introduced. In accordance with it, coal combines were reorganized as production associations, which have become the primary (principal) unit of the sector. A total of 54 coal (shale) extracting and 3 concentrating production associations are now functioning in the USSR Ministry of Coal Industry. Auxiliary production operations and services have been concentrated and specialized, specific administrative functions have been centralized in the associations, and in a number of cases the use of financial, material and technical resources have become more purposeful and effective. Development of a new mine construction administration structure is nearing completion. Significant changes--both quantitative and qualitative--were experienced by the structure of the ministry's central machinery.

As a result of the master plan's introduction, according to data of the USSR Ministry of Coal Industry the administrative staff decreased by more than 20,000 persons in 1974-1976.

Improvement of the sector's administrative system was accompanied by broad introduction of automated control systems based on computer technology and

* "Materialy XXVI s"yezda KPSS" [Proceedings of the 26th CPSU Congress], Moscow, Politizdat, 1981, p. 49.

the methods of mathematical economics. Just in the 10th Five-Year Plan the capital outlays on creation of new ASUs [automated control systems] and modernizing operating ones and other measures associated with introducing computer technology totaled 91.4 million rubles. The resulting savings (according to the ministry's estimates) were more than 60 million rubles of state assets, to include 30.5 million resulting from a decrease in the cost of production (services). In 1981 26.7 million rubles were spent for these purposes, and the savings foreseen from introducing computer resources--on the order of 10 million rubles--were accounted for in the profit plan.

At the same time the great and diverse experience of coal industry's operation in the new conditions, accumulated during this time, permits us not only to evaluate, with sufficient objectivity, the positive sides of the reorganization but also, what is no less important, to critically analyze the mistakes made both during preparation of the master plan for the sector's administration and during its implementation.

The first work results showed that cumbersome, hard-to-control associations were created in some coal basins. Administrative functions of the principal and auxiliary production operations were not always centralized with sufficient grounds. Certain forms of activities were omitted in the associations, requiring subsequent introduction of new positions and structural subdivisions. In particular a weakening of the engineering service--not only in the associations but also in the mines and open pits--produced negative consequences. Adequate control could no longer be maintained, including on the part of the ministry, over important issues such as reproduction of the work front and development of coal mining enterprises. In the last 6 years the actual tunneling volume decreased by more than 600 km for the sector as a whole. To correct this abnormal position, the ministry established centralized operational control over fulfillment of tunneling plans as of 1980. But we have not yet been able to catch up, which is having an unfavorable effect on prompt, high quality preparation of the working faces, and in the final analysis on the coal mining level.

It cannot be said that the USSR Ministry of Coal Industry did not take steps to correct these and other shortcomings. To improve the administrative structure it published several orders, wrote directive letters and instructions and developed statutes and official instructions. Recently the production associations that have been the most difficult to control have been broken down into smaller units (basically in the Ukrainian SSR), an industrial coal mining association was created in the Kuznetsk Basin, and the rights of a socialist state production enterprise were returned to 111 mines. But all of these solutions were implemented by the ministry without the efficiency required in such cases. Many decisions concerning expansion of the rights of mine and open pit directors were sometimes left to the discretion of the association directors--that is, the authority for making such decisions was transferred to them, and as a consequence this measure was often not introduced.

The absence of careful preparations and of sufficient grounds for resolving issues pertaining to change in administrative structure attracts attention. This is true despite the fact that back in 1972 the USSR Ministry of Coal Industry created an all-union scientific research institute of administration

(the VNIIUgol'), which employs a large collective of scientists. But this institute has so far been doing a weak job of objectively analyzing the existing master plan for administration and developing, on this basis, major measures for improving it. It is no accident that all proposals for making the production associations smaller, for creating industrial associations and for expanding economic independence of the mines were introduced mainly by local executives and, as often occurs in such cases, not always with adequate grounds.

Meanwhile the demand for effective, scientifically grounded recommendations for improving the administrative structure of coal industry is considerable. It is no secret that some executives, making certain proposals for changing the administrative structure, sometimes approach the issue with their own interests in mind, rather than the state's. Some tend to explain their own shortcomings and mistakes, especially those associated with developing mine management and reproducing good quality working faces, by blaming imperfections in the existing administrative structure. Without a doubt, it is to blame for a great deal. But to assume the road of an administrative "shake-up" means to worsen the state of affairs at the enterprises even more, since it is the principal units of coal production--the mines and the open pits--that suffer the most. The fact is that in the period during which the associations were created, many vitally important subdivisions servicing the coal mining enterprises were formed and enjoyed further development. Before making a decision to reduce the size of associations, we would need to thoroughly weigh everything, so as not to worsen the support provided to the principal production operations by auxiliary services. Thus some coal mining associations that appeared as a result of decentralization, in the Ukrainian SSR for example, were created without their own adequate material-technical supply base, mining equipment repair base, capital construction program and so on.

There is also the economic side of the issue. In 1976-1981 the ministry's coal mining volume dropped by 1 percent while the administrative staff increased by 19 percent. And meanwhile the outlays on maintaining the administrative staff--of course with a consideration for a centralized increase in wages--grew by 34 percent. This could hardly be called a proper situation. It is contrary to the directives of the party and government concerned with raising production effectiveness and achieving economical management.

As we know, when the coal mining production associations were created, the mines and open pits were deprived of their legal independence and were placed into the composition of these associations as production units. In this case a significant proportion of their former functions were centralized in the association. But by the nature of their activities the mines and open pits are independent enterprises that are not associated with one another in terms of their production operations. They do not require any sort of mutual services or cooperative deliveries of equipment or materials in order to fulfill their main purpose--mining coal.

What essentially happened in coal industry is that the administrative subdivision of the mining administration (association) acquired the rights of a socialist state production enterprise. Today all financial and loan-paying operations of the production units (the mines and open pits), including accounts

with suppliers and customers as well as payment for completed jobs and services, are handled centrally in the association.

When the mines and open pits lost their economic independence, the effectiveness of economic levers upon the results of economic activity decreased. The final sums of the material incentive funds of production units are determined only on the basis of the work results of the association as a whole, rather than of the concrete mine or open pit. Production associations often confiscate some of these assets from mines and open pits that are working well, without their awareness and consent.

The director of the coal enterprise (production unit) does not in fact bear responsibility for overspending the wage fund as a result of poorer work in the enterprise's principal activity, inasmuch as he knows that the association will cover this overexpenditure, once again at the expense of the enterprises that are working well. This diminishes the role of an important economic lever in the system of khozraschet relations--wages.

In the end, the situation that evolved in the sector was one where the financially and economically poor work of some enterprises is now compensated by other enterprises that are working well. This has caused the executives of the production units to weaken their attention toward economic problems. In comparison with 1975, in 1981 the proportion of mines and open pits that had not satisfied the production cost plan increased.

Complete centralization of housing and personal services in the association had an unfavorable effect on the condition of mine settlements in a number of cases, especially those located far from cities. In the opinion of the central committee of the sector's trade union, maintenance of club institutions and athletic facilities has worsened significantly, and some of them are in disastrous condition.

Without a doubt the production associations are a progressive form of administration, one that has proven itself in many sectors of the national economy. But as experience has shown, significant restriction of the rights of the mines and open pits upon their inclusion in the associations without regard to the specific features of coal production made their administration more complex, and on the whole it did not promote improvement of the sector's work. The time has come to radically resolve the question of furnishing the coal mining enterprises with the appropriate rights that would permit them to manage their mining affairs in the most effective way possible.

Today the ministry is conducting research aimed at developing scientifically grounded criteria by which to evaluate the complexity of control of mines and open pits and determining the optimum dimensions of production associations, such that production volumes would be coordinated sensibly with the concrete content of the organizational structures, the manning, the rights and responsibilities of laborers and white collar workers at all levels and in all units of coal production administration. There are plans for expanding the rights of coal mining production units contained in the associations to some extent.

But at the same time, while we expand the rights of the mines and open pits it would be suitable for us to retain the positive things that production

associations have to offer--the possibility for concentrating material and financial resources in the most important areas of production and construction, and maneuvering them efficiently. This problem can be solved by centralizing, within the associations, a particular amount of the assets required by the concrete conditions and creating special reserve funds to be used to provide effective assistance to enterprises that find themselves in a difficult financial situation owing to some objective circumstances.

In addition we cannot ignore some other, no less important aspects of qualitative improvement of the administrative system of coal industry--for example the problems associated with raising the effectiveness of managing large mines and open pits of unique size--both those functioning today and those which will appear in the foreseeable future. Thus today the single "Bogatyr" open pit (at the Ekibastuz deposit) is mining more coal than all mines of the Karaganda Basin taken together. Naturally the standard administrative structures and manning tables of the conventional open pits cannot be applied to such a giant.

The national economy loses a great deal from imperfections in the control of large fuel-and-economic complexes such as the southern Yakutsk, the Kansk-Achinsk and Ekibastuz complexes. Incidentally this is an intersector problem to a significant extent, and by providing assistance to the USSR Ministry of Coal Industry in solving it quickly we will be able to achieve a significant impact for the state owing to more-sensible use of the labor, material and financial resources of the sectors of the national economy participating in their creation. The experience of applying more-progressive administrative systems similar to the territorial-production complexes has already been acquired in the country.

L. I. Brezhnev emphasized in the Accountability Report of the CPSU Central Committee to the 26th CPSU Congress that at the moment, "what would seem to be a simple and very mundane thing--an economical attitude toward public wealth and the ability to utilize everything we have completely and suitably--is becoming the backbone of economic policy. The initiative of the laboring collectives and mass party work must be aimed at this goal. Technical policy, the policy of capital investments and the system of planning and reporting indicators must be aimed at this as well."*

It is precisely for the purpose of reaching these goals that the CPSU Central Committee and USSR Council of Ministers published their well-known decree on 12 July 1979, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality." It imposes new, higher demands on the adequacy of production planning grounds, and it demands significant improvement of the use of existing and new production capacities.

In satisfaction of this decree, the USSR Ministry of Coal Industry developed a program of concrete measures, the implementation of which is being systematically monitored by special commissions created at all administrative levels.

* "Materialy XXVI s"yezda KPSS," p 42.

Today more than 150 specially written methodological and standard-setting documents are being introduced into the associations, and a system of progressive technical-economic norms and standards associated with consumption of materials and use of equipment, production capacities, fixed capital and so on is actively being prepared and approved. A certain amount of work is being done to insure stability of planning quotas. The proportion of amendments made in the coal mining plan for the sector as a whole has decreased. In 1979 the coal machine building plants were converted to using a standard net production indicator. The system of material stimulation of labor is being improved by raising the interest of collectives in adopting and fulfilling intensive plans and achieving high end results in production. In particular, fulfillment of the plan in terms of production volume, labor productivity, production cost and the quality of coal and other products is the principal indicator by which the results of economic activities are evaluated for the purposes of paying bonuses to mine and open pit executives, and by which the results of socialist competition are assessed.

The sector has created the association passport, which serves as the basis for drafting plans for economic and social development, for selecting the most sensible ways of raising production effectiveness and for increasing the reserves of additional production.

In the course of improving the economic mechanism we are implementing measures aimed at developing progressive forms of mutual ties between coal industry enterprises and the suppliers of material and technical resources. A plan for development of direct long-term business ties in support of delivery of production equipment to coal industry enterprises was approved for 1981-1985.

An effort is being made to raise the effectiveness and improve the structure and planning of capital investments. The plans for commercial construction and for the volumes of construction and installation in 1982 and in the 11th Five-Year Plan have been drawn up with a consideration for reducing the number of newly begun construction projects, concentrating assets on the most important facilities already under construction and reducing the volume of unfinished construction. Thus the volume of unfinished construction is to be 730 million rubles below the standard by the end of the current five-year plan.

In 1981 the enterprises and institutes were converted to a khozraschet system of organizing efforts to create, assimilate and introduce new equipment on the basis of orders (contracts) with the purpose of hastening technical progress and expanding new, highly effective production. A single fund for development of science and technology was created.

Utilization of the indicated organizational and economic levers in the administrative system of coal industry is already having a certain positive influence on the work of the sector's enterprises and organizations in a number of cases. However, the steps being taken by the USSR Ministry of Coal Industry to improve the economic mechanism are not yet providing an adequate return. This could be explained primarily by the fact that the measures foreseen by the decree are not being implemented in integration with one another, and they are not always implemented in their entirety. Unfortunately the five-year plan was approved late, the procedures used in writing it require some improvement, the quotas

are not fully balanced and so on. Nor can we ignore the fact that in the last few years the volume of planning and accounting documents has risen excessively. According to data of the USSR Ministry of Coal Industry the annual industrial plan it submitted to the USSR Gosplan in 1957 was 87 pages long. This year the planning documentation exceeded 1,100 pages--that is, it increased by 13.5 times, which is having an unfavorable effect on the quality of the plans and reducing the possibilities for improving the entire planning system.--

Of course, successful solution of some problems associated with improving the economic mechanism is not within the means of the ministry alone. But much in this matter does depend on it, upon the purposefulness and unity of action of all elements of the sector's administration, and mainly the administrative machinery of the ministry. Is the administrative machinery of the USSR Ministry of Coal Industry satisfying these requirements? Not always, unfortunately.

In the 10th Five-Year Plan the cost of industrial productive capital in the USSR Ministry of Coal Industry increased significantly to 23 billion rubles, while the increase in coal mining capacities was 62 million tons per year. One of the most important tasks of the ministry's administration is to insure more effective utilization of this substantial economic potential. But the USSR Ministry of Coal Industry is not yet dealing adequately with these issues. As an example the ministry's Administration for Long-Range Development of Coal Industry and Capital Investments has created a division for analysis, development and utilization of the existing output capacities of coal enterprises. But this division concerns itself with these issues only when the time comes for drafting annual plans. Meanwhile another subdivision--the division for long-range development of coal enterprises--analyzes the use of output capacities in preparation for drafting of five-year and long-range plans. And as far as the way coal enterprises utilize their output capacities within a quarter of a current year is concerned, this is within the realm of responsibility of the division for technical-economic analysis of the Administration of Computer Technology and Organizational Structures.

This situation could hardly promote improvement in the use of productive capacities. In the last five-year plan the standard production capacities of a significant quantity of enterprises were systematically underutilized, and their output-capital ratio dropped. Frequently the proposals made by the Administration for Long-Range Development of Coal Industry and Capital Investments associated with improving the use of productive capacities are not supported by technical-economic calculations and material resources, and they often remain on paper.

The CPSU Central Committee and the USSR Council of Ministers demand a qualitatively new approach to economic and social planning of the development of the national economy, and significant growth in the role of five-year and long-range plans. Five-year plans must now be written on better grounds, using a broad range of indicators broken down in relation to each year of the five-year plan.

This raises doubt concerning the effectiveness of the existing structure of planning subdivisions of the ministry's central machinery, where one administration deals with the issues of long-range planning, to include five-year

planning, while another concerns itself with current planning covering the period of a year. I believe that it would be unsuitable to separate long-range and current planning within the ministry's administration today, since it would not promote timely and adequate drafting of five-year and annual plans. Incidentally at a lower level of administration--the Ukrainian SSR Ministry of Coal Industry--these problems are all handled by a single economic planning administration, to which the division for analyzing and developing existing enterprise capacities was transferred. There are also other shortcomings in the existing administrative structure.

The state of affairs that has evolved in a number of structural subdivisions of coal industry concerned with the basic premises of the master plans for the sector's administration requires persistent attention, to include from the appropriate central organs. In any case the suitability of carefully and deeply analyzing the effectiveness of the sector's entire administrative structure with the purpose of making the necessary changes in the shortest time possible is obvious. Solution of isolated problems cannot produce tangible, positive results.

The need for doing this is implied by decisions of the 26th CPSU Congress, which requires successive improvement of the administration of the national economy with a consideration for the growing scale of production, the greater complexity of communications and the achievements of the scientific-technical revolution, and improvement of planning organization, the structure and the forms and methods of work of planning organs with the purpose of achieving maximum utilization of the possibilities and advantages of mature socialism. USSR Council of Ministers Chairman N. A. Tikhonov stated in a report to the 26th CPSU Congress: "Relying on the accumulated experience, we must tailor the developed master plans in application to the objectives of the 11th Five-Year Plan. Everything that is retarding growth and hindering forward progress must be eliminated, and the better things that have been tested by life must be given ample room for development."*

Without a doubt it would be extremely difficult to resolve these issues, especially in relation to coal industry, which is such a large, cumbersome and multifaceted sector of the national economy. These issues affect practically all aspects of the technical production and socioeconomic activities of the enterprises and organizations. But were we to eliminate conservatism in this matter, under otherwise equal conditions the labor collectives will be able to work more rhythmically and productively, and they will achieve better results. All efforts to improve the system of the sector's administration must be aimed at a single goal--all-out improvement of the effectiveness of the work of the enterprises and promotion of growth in the coal mining volume, with emphasis on high quality and lowest outlays. These are precisely the criteria which executives must always consider when addressing and solving administrative problems at all levels.

* "Materialy XXVI s"yezda KPSS," p 124.

NON-NUCLEAR POWER

MINENERGO ORGANIZATIONS PLEDGE TO SUPPORT SOVIET FOOD PROGRAM

Moscow ENERGETIK in Russian No 10, Oct 82 pp 3-5

/Article: "From the Socialists Pledges of the Collectives and Organizations of the USSR Ministry of Power and Electrification for Realizing the USSR Food Program"⁷

[Text] In the Field of Rural Electrification

To provide for the electrification of agricultural production and to meet the domestic needs of the rural population it is necessary to increase the output of electric power for agriculture as compared with 1980: in 1982 - 1.1-fold, bringing the total to 120 billion kW-hours; in 1983 - 1.17-fold, or to 130 billion kW-hours; in 1984 - 1.3-fold, or to 143 billion kW-hours; and in 1985 - 1.4-fold, or to 157 billion kW-hours.

In order to reduce agricultural product losses caused by disruptions in the electric power supply it is necessary to achieve a significant improvement in the reliability of the power supply for agriculture. To accomplish this it is necessary to:

- in the years 1982 through 1985 to provide a reserve 1,185 power supply and 1,455 secondary transformers for the 35 - 110 kV transformer substations by increasing their number by the end of the 11th Five-Year Plan some 1.3-fold as compared with 1980;

- to make capital repairs to rural .4 - 20 kV electric power networks each year of the five-year plan at a cost of not less than 115 million rubles as opposed to the 95 million rubles spent on such work in 1980;

- each year provide for the adoption of automatic devices (APV and AVR) at not less than 2,000 6-20 kV feeders, and also to reduce and break up into smaller units not less than 2,300 feeders per year;

- prior to the 1982 harvest connect not less than 400 newly installed grain processing flow lines, grain cleaning points, vitamin meal units and other agricultural facilities to power sources.

To improve the reliability of the power supply and to connect the newly installed agricultural facilities to power sources on a timely basis, it is necessary to:

- to provide for the introduction of 102,900 km of rural power transmission lines at voltages of 20 - 6 - .4 kV ahead of schedule, prior to the 60th anniversary of the USSR;

- to introduce for the power supply of rural consumers by years of the 11th Five-Year Plan (with the following breakdown): 35 kV and higher power transmission lines: 1982 - 18,400 km, 1983 - 17,800 km, 1984 - 15,200 km, 1985 15,500 km; .4 - 20 kV power lines: 1982 - 103,400 km, 1983 - 103,600 km, 1984 - 103,000 km, 1985 - 102,000 km.

In order to improve the stability of the power supply for agricultural consumers it is necessary to improve the quality of the construction of electrical networks in rural areas, for which it is necessary to introduce new kinds of equipment and design in the years 1982 through 1985:

- complete sets of 35/10 kV transformer substations with a rated capacity of up to 6,300 kV amperes of the non-portal type using standardized designs in an amount of 1,525 items, including by year of the five-year plan: 1982 - 25, 1983 - 300, 1984 - 500, and 1985 - 700;

- reinforced concrete supports for .4 kV power lines on 9.5 meter up-rights on lines that are 48,000 km in length, including by years of the five-year plan: 1982 - 9,000 km, 1983 - 11,000 km, 1984 - 13,000 km, and 1985 - 15,000 km;

- reinforced concrete supports for 10 kV power lines on SV-105 uprights on lines that are longer than 16,000 km in length, including by years of the five-year plan: 1982 - 500 km, 1983 - 2,000 km, 1984 - 4,000 km, and 1985 - 10,000 km.

In order to increase labor productivity and the quality of the work being done by 1985 it is necessary to achieve the transfer of not less than half of all workers in rural electric power networks to the brigade forms of organizing and motivating labor.

Regarding the Development of Subsidiary Farms for the Enterprises and Organizations of the USSR Minenergo

To increase the number of subsidiary farms from 90 in 1981 to 360 in 1985 at the associations, enterprises and organizations of the sector.

To produce more agricultural product at the subsidiary farms in 1982 than was produced in 1981; a 2.2-fold increase in grain, a 2.4-fold increase in potatoes, a 1.1-fold increase in vegetables planted in open soil, a 1.2-fold increase in vegetables planted in enclosed soil, a 1.15-fold increase in meat production, a three percent increase in milk, a 1.2-fold increase in eggs, and a 1.2-fold increase in fish.

-to bring the production of agricultural goods to these levels in 1985: grain - 8,200 tons or a 6.5-fold increase, potatoes - 6,000 tons or a 9.2-fold increase, vegetables planted in open soil - 4,400 tons or a 1.6-fold increase, vegetables planted in enclosed soil - 4,000 tons or a 4.4-fold increase, meat to 5,900 tons or a 2.3-fold increase, milk to 4,700 tons or a 2.2-fold increase, eggs to three million or a 2.3-fold increase, and fish to 1,800 tons or a 2.4-fold increase over 1981; to increase the useable area of hothouses from 120,000 square meters in 1982 to 313,000 square meters in 1985; to increase the number of head of beef cattle from 5,800 in 1982 to 6,500 head and of hogs from 25,400 to 33,300 head; and to increase the number of fish farms from eight to 14.

Regarding the Rendering of Ministerial Assistance to Agriculture

Each year to accomplish work at the kolkhozes and sovkhoses amounting to not less than two million rubles for rendering organizational-technical assistance in repairing the power units of grain processing flow lines, grain cleaning points, elevators, tractor and field machinery participating in the harvest.

In 1982 to fulfill work in repairing and rendering organizational-technical assistance in the operation of electric power networks and power stations belonging to kolkhozes and sovkhoses valued at 350,000 rubles in excess of the plan.

To provide at the dependent kolkhozes and sovkhoses the repair of units for the procurement and processing of mixed feed, vitamin meal units, and other equipment which provides a reliable power supply for the livestock complexes, farms, poultry farms during the wintering of cattle and poultry.

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NON-NUCLEAR POWER

TRADE UNION TASKS IN IMPLEMENTING COUNTRY'S FOOD PROGRAM

Moscow ENERGETIK in Russian No 10, Oct 82 pp 4-5

/Article by V.I. Masyuk, assistant to the chairman of the Central Committee of the Trade Union: "Regarding the Tasks of the Trade Union Organizations in Accomplishing the USSR Food Program"7

/Text/ The 3rd Plenum of the Central Committee of the Trade Union of the Workers at Power Stations and of the Electrical Equipment Industry has discussed the question "regarding the results of the May (1982) Plenum of the CPSU Central Committee and the tasks of the trade union organizations in accomplishing the USSR food program, the proposals and conclusions outlined in L.I. Brezhnev's report at this Plenum."

In his speech the Chairman of the Central Committee of the Trade Union, N. P. Simochatov, noted that the key task of the broad program for the economic and social development of the USSR for the years 1981 through 1985 and the period up to 1990, which was outlined by the 26th CPSU Congress, is to do everything possible to improve the material well-being of the Soviet people.

A clear example of the Communist Party's and Soviet government's concern for the implementation of this program was the May (1982) CPSU Central Committee Plenum, which approved the food program of the USSR for the period up to 1990.

In his speech at the Plenum, L.I. Brezhnev thoroughly analyzed the results of the development of agroindustrial complex and disclosed the basic directions for its further improvement. He also outlined the ways and means for accomplishing important measures for coming up with a reliable supply of food for the population.

The party has posed this task: using the developed economic potential of the Soviet Union, to provide within as short a span of time as possible a stable supply of all kinds of foodstuffs for the population and to significantly improve the structure of feeding Soviet citizens at the expense of more valuable products.

In solving this task it is necessary to come up with a target comprehensive approach, coordination and the combining of the efforts of both agriculture and the sectors of industry which provide services to agriculture.

The May (1982) CPSU Central Committee Plenum emphasized that in realizing the tasks evolving from Brezhnev's speech each sector of the national economy, all labor collectives and each Soviet worker must make a maximum contribution.

The 2nd Plenum of the All-Union Central Trade Union Council has tasked the trade union organizations with specific responsibilities for executing the decisions of the May CPSU Central Committee Plenum.

The 3rd Plenum of the Trade Union Central Committee has noted and thoroughly examined specific steps for the successful realization of the tasks given to the trade union committees.

The workers of the electric power and electrical equipment and peat sectors of industry, as all Soviet people, have been making an important contribution of their creative labor to the subsequent intensification of agriculture and increasing its technical outfitting. A significant amount of work has been done to develop the electric power networks and to improve the reliability of the power supply to agriculture.

The enterprises and organizations of the USSR Minenergo have done a significant amount of work in the construction and introduction of agricultural facilities, facilities for the food industry, agricultural machine building, mineral fertilizers and other sectors of the agroindustrial complex.

In order to successfully carry out the assigned plan assignments for the further development of rural electrification the Central Committee and the local trade union committees have been giving a great deal of attention to the development of socialist competition and the extensive adoption of progressive methods of labor - including comprehensive repairwork and the brigade contract, etc.

The experience of socialist competition, which was approved by the Trade Union Central Committee, among the collectives and enterprises for the guaranteed reliable supply of electricity for rural consumers is being used at many network enterprises of the sector.

Emphasis has been given to the work in adopting the brigade forms of organizing and paying for labor in conjunction with the operational and repair servicing of electric power networks. The collectives of the network enterprises of Kostromaenergo have accumulated a particularly large amount of positive experience in this regard.

The experience of these collectives, which was approved by the USSR Minenergo and the Trade Union Central Committee, has been recommended for large-scale dissemination.

At the same time at several collectives socialist competition is poorly developed and little is being done to disseminate the experience and to support the initiative of the leading workers. There are still large production losses caused by violations in labor discipline and the unsatisfactory organization of labor. Not all trade union organizations are carefully studying the reasons for this poor work. They have accepted them and are not helping the lagging organizations to achieve the level of the leading organizations.

The primary task is to achieve a high level of reliability of the power supply. One cannot consider the situation to be normal when each year there are more than 200,000 disruptions in rural electric power networks, which is approximately equal to four to five disruptions per kolkhoz and sovkhoz.

Network construction requires a great deal of attention: due to the poor organization of labor and material-technical supply difficulties last year the plan for the introduction of .4 - 20 kV power transmission lines was not fulfilled.

Some construction and installation and other organizations did not fulfill the plan for the introduction of facilities for livestock and fish farming.

It is necessary to significantly improve the organization of labor and to more extensively make use of the brigade contract in construction. In successfully implementing the USSR food program an important role goes to the scientific-technical community, inventors, rationalizers - NTO /Scientific-Technical Society/ and the VOIR /All-Union Society of Inventors and Rationalizers/. These organizations must more actively develop and adopt into production the achievements of science and technology in the field of electrification and the mechanization of labor processes in rural areas.

Economic managers and trade union committees must be ever concerned about the creation of normal working conditions, rest and relaxation, and the cultural leisure of the workers who are engaged in servicing electric power networks. It is necessary to significantly increase the amount of attention being given to providing the workers with safe working conditions, observing the safety rules, and improving medical support.

An important place in realizing the USSR food program is held by the subsidiary farms of the enterprises and organizations. These farms are an additional source for the production of agricultural commodities, including orchards and market gardening.

The execution of the measures, which were developed by the collegium of the USSR Minenergo and the presidium of the Trade Union Central Committee in accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers regarding the development of subsidiary farms, has made it possible to significantly expand the network of these farms at the enterprises and organizations of the sector.

Work has been especially well organized for the creation of new and the development of existing subsidiary farms at our enterprises in Sverdlovskaya Oblast and in several other rayons. The efforts and successes of the collective at the Sredne-Ural'skaya GRES and the attention of public organizations to the development of subsidiary farming have been noted by a certificate from the All-Union Central Trade Union Council.

At the same time not all economic managers and trade union committees of the enterprises and organizations are actively working on the creation of their own food production base.

Subsidiary farming at our enterprises in the Belorussian SSR, the Udmurtskaya ASSR, Volgogradskaya Oblast and several other rayons is being developed at too slow a pace.

At several enterprises a significant lag in the construction of livestock facilities is being permitted (Zaporozhskaya, Dobrotvorskaya and Uglegorskaya GRES's, the Sayano-Shushenskaya GES's and others).

Our enterprises in Omskaya, L'vovskaya, Ul'yanovskaya, Poltavskaya and several other oblasts do not have subsidiary farms. This sort of situation must be eliminated right away. Moreover, all forms of organizing subsidiary farms can be used. This includes the creation of a single farm that is common to several enterprises and the participation in an interfarm association of enterprises with the rental of livestock facilities (Rostovskaya TETs-2, Volgodonskaya TETs-2), and partial participation, etc.

The specific nature of labor in the subsidiary farms requires the serious attention, observing safety rules, and protecting the health of the workers on these farms. The administration and trade union committees must be concerned about improving the moral and material motivation of the workers to increase agricultural output as well as the creation of housing and cultural-domestic conditions that are required.

Collective orchard and market gardening and the private farms of the workers and employees must be developed more extensively.

The successful solution of this key governmental task - the implementing of the USSR food program depends greatly upon the extensive development of organizational and mass-educational work and the careful study by each worker of the documents from the May (1982) CPSU Central Committee Plenum and the conclusions and proposals in Brezhnev's speech.

In the decree passed by the 3rd Trade Union Central Committee Plenum the tasks for the trade union organizations are spelled out for the successful implementation of the decisions of the May (1982) CPSU Central Committee Plenum and for accomplishing the USSR food program.

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NON-NUCLEAR POWER

MOSCOW EXHIBITION DEVOTED TO RURAL ELECTRIFICATION

Moscow ENERGETIK in Russian No 10, Oct 82 pp 29-30

/Article by B. L. Trakhtman, director of the "USSR Electrification" pavillion at the VDNkh /Exhibition of Economic Achievements (in Moscow)7:
"Exhibition: Improving the Reliability of Rural Electric Power Supply"7

/Text At the VDNKh a thematic exhibition "improving the reliability of the rural electric power supply" has been held. More than 200 exhibits were on display here. The exhibits demonstrated the current status and prospects for the future development of rural electric power networks; they also showed ways to further improve their reliability.

The main directions in improving the reliability of the distribution networks are to construct new 10-110 kV networks, to provide a reliable standby supply within the network, to reduce the average length of the feeder lines, and to replace network elements with the new improved versions.

One effective way to improve the reliability of the distribution network is to section and combine with automatic repeat engagement (APV) and automatic reserve switching (AVR). These systems are being successfully adopted by network enterprises (Lenenergo, Kalininenergo) and the design institutes.

Several modifications of KRUN 10 kV equipment racks (the Moscow and Kuybyshev "Elektroshchit" plants, Litovglavenergo, Belenergoremnaladka and others) using vacuum circuit breakers, transformers for their own needs and semiconductor sets of relay shielding and automated equipment (RZA), which successfully perform the functions of sectioning with AVR, were shown at the exhibition.

The Povolzhskoye department of Sel'energoprojekt demonstrated an automatic sectioning separator, executed on the basis of a circuit breaker, with the separation of the damaged sector into the non-current APV pause.

Several of the exhibits demonstrated ways to improve operational-dispatch management in the distribution networks.

The Stavropol'energo administration offered an interesting solution for providing stable radio communications in the UHF frequency band. This calls for the use of television retransmitters, which almost solves the problem of readability in mountainous terrain.

A model of a dispatch shield with mnemonic symbols made of magnetic resin was demonstrated; this device significantly simplifies the work of personnel with the layout of the network.

In the field of improving the remote signaling from the substations of the distribution networks, the central electrical equipment laboratories of several power systems are doing some useful work. Khar'kovenergo, Kalininenergo, Soyuzenergoavtomatika displayed some work that they have been doing in this field at the exhibition.

One of the most efficient means for regulating voltage in the networks and to reduce power losses in transmission is to use static condensers during the automatic monitoring of the number of condensers that are connected. The Latvglavenergo and the Odessa polytechnical institute displayed such devices.

Of importance for improving the operation of overhead power lines is the set of measures having to do with the fight against icing. At the exhibition devices for signaling the appearance of icing were demonstrated (MIISP of the USSR Ministry of Agriculture).

The Bashkir Agricultural Institute displayed a set of devices for safeguarding power transmission lines from deviations and for strengthening the fastenings of wires on the aligning plug insulator and for preventing them from falling when there is a break in the fastening.

The specialized institutes of the USSR Minenergo are doing some useful work in the field of improving the reliability of rural distribution networks. The work of the leading sectoral institute in the field of rural electrification, Sel'energoprojekt, was extensively shown at the exhibition. This organization proposed the construction of 35 kV power lines using reinforced concrete supports in combination with rod-like insulators, including for regions having a high level of icing.

Interest was shown for an anti-vibration clamp for securing 10 kV power transmission line wires to the aligning plug insulators, which prevent the supports from falling during line breaks and for reducing the vibration of the wires. Also of interest was an improved anchor angle support for a 110 kV power transmission line.

Improved methods for calculating distribution networks, optimal layouts for 110/35/10 kV substations, a new type of spiral high-frequency rejector with reduced losses, and remote signaling equipment were demonstrated.

According to developments of Sel'energoprojekt the plants have produced new types of complete set step-down 110, 35 and 10 kV substations, which possess increased reliability and safety.

A substantial means for reducing the amount of time for switching off consumers is to speed up the search for the location of damage within the networks. In this field Soyuztekhnenergo, Soyuzenergoavtomatika, Sel'energoprojekt and the power systems are having some success - exhibits of their work were shown at the exhibition.

Soyuztekhnenergo, Sel'energoprojekt, Soyuzenergoavtomatika and the USSR Ministry of Agriculture's MIISP offered devices for current shielding 6-20 kV power transmission lines without the traditional, separate current transformers.

Great interest was shown in a disengagement meter using a high-voltage circuit breaker which registers the level of disengaged currents (a development of Soyuzenergoavtomatika).

ENIN /Power Institute/ imeni G. M. Krzhizhanovskiy demonstrated the signaling of singlephase ground shorts in compensated networks.

Enterprises of the Central Design Bureau of Glavenergomont, ENIN and UGPI /Ul'yanovskiy State Pedagogical Institute imeni I. N. Ul'yanov/ of Tyazhpromelektroprojekt offered an arc-suppressing reactor for 35 kV networks with the continuous regulating of inductivity.

Also to be mentioned is the set of devices which were developed by the enterprises of the USSR State Committee for the Supply of Production Equipment to Agriculture for servicing the electrical equipment in rural networks. These devices reduce outlays for the repair, installation and operation of electrical equipment, and they reduce the number of standdowns.

Several organizations (MEI /Moscow Order of Lenin Power Institute/ and the Saratov institute of the USSR Ministry of Agriculture, the Ivanovo Power Institute, the Tula Polytechnical Institute, and Dneproenergo) displayed devices for improving the reliability of the operation of a motor electric drive.

The network enterprises demonstrated check stands, units for testing tools, lamps, automated devices, and cable instruments.

The power systems are successfully working in the field of improving the efficiency of the use of electric power in agriculture through the use of compensating for the reactive capacity, equalizing the load schedule using the accumulation of thermal energy.

Leningrad Oblast power workers have adopted a set of technical developments which provide a substantial improvement in the reliability of the power supply to livestock farms so that they can be switched to first category.

On the threshold of celebrating the 60th Anniversary of the formation of the USSR it is necessary to emphasize that a great deal of work is being done in rural electrification in the national republics.

Belorussian SSR. The Vitebsk power network enterprise demonstrated a modern, well-equipped repair and production base for the operational servicing of distribution networks.

Kazakh SSR. The Kazakh Scientific-Research Institute of the Power Industry demonstrated a "plyaska" extinguisher for 35-330 kV wires in the form of a natural specimen.

The Kazakh SSR department of Sel'energoprojekt offered an essentially new design of a reinforced concrete support for 35-110 kV power lines without the carrying traverses.

The Kirghiz SSR. Kirgizelektroset'sstroy displayed the construction of a power line in difficult conditions for the electrification of high mountain areas.

The Lithuanian SSR. Litovglavenergo offered reliable management by a 10 kV circuit breaker for grounding the phases of lines in order to shunt the location of a singlephase ground short or to create a two-phase short and determine the location of damage using fixing instruments.

The operation of the Lithuanian power workers displays the high quality of work organization in the republic's distribution networks. In this republic agriculture is served by 44 rayons of power networks. At 30 substations they have adopted the radio control of 10 kV power lines; and from 45 substations remote signaling is used extensively.

Moldavian SSR. Moldglavenergo demonstrated the convergence of phases, an interphase insulating strut installation for overhead 10 kV power lines. This was presented in the form of a model. The installation makes it possible to reduce capacity losses within the network.

The eastern power networks of Moldglavenergo have developed and manufactured a storing device for singlephase ground shorts using modern electronic equipment; this makes it possible to estimate the total number of ground shorts with the recording of their total duration.

Moldglavenergo is now using integrated microcircuits in remote control equipment.

Ukrainian SSR. Dneproenergo suggested the use of fiberglass rods with an epoxy adhesive for 10 kV power transmission line traverses; this makes it possible to eliminate the use of insulators. Dneproenergo's calculating device makes it possible to automatically estimate the resource of capacity of the power transformers depending upon the load and other conditions.

L'vovenergo offered a circuit breaker of an external installation, in which the drive is equipped with a special spring-controlled unit that raises the disconnect capacity of the apparatus some 5-fold.

The Production Association Soyuzenergoavtomatika of the UkSSR Ministry of Power and Electrification demonstrated the varieties of APV layouts for 6-35 kV power lines, which use simple equipment that requires a minimum amount of maintenance.

Estonian SSR. Estonglavenergo demonstrated the combining of the operational rod with a voltage indicator.

Many power enterprises (Latvglavenergo, Litovglavenergo, Kazelektroset'stroy, Tadzhikglavenergo, Moldglavenergo, Vitebskenergo, and others) are working to increase the level of mechanization of repair work in the distribution networks. They demonstrated several devices: a brushcutter for cleaning the paths of power lines, a trailer and tractor for transporting equipment and materials, a hand cart for unrolling power transmission line wires, a crane for installing circuit breakers, a suspension fitter's ramp and platform for replacing power line insulation, an attachment for transporting reinforced concrete foundation beams, manual winches, a device for replacing insulators on power lines while under voltage, and a small welding transformer.

The brigade form of organizing labor in electric power networks is being used more and more (Tselinenergo, Gomel'energo, Gorenergo, Stavropol'energo and others). These organizations are also using the comprehensive servicing of power networks in fixed earth. The monthly standard assignment is providing a high quality of work and a reduction in the number of consumer disconnections.

The beautifully formulated and expressive exposition of the exhibit held the interest of the visitors and specialists.

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NON-NUCLEAR POWER

POWER SUPPLY FOR RURAL CONSUMERS

Moscow ENERGETIK in Russian No 10, Oct 82 pp 27-28

/Article by A. I. Selivakhin and R. Sh. Sagutdinov, candidates for the degree of doctor of technical sciences, and V. I. Krasnikov, engineer: "A Device for Safeguarding Rural Low Voltage Electric Power Networks from Line Breaks"/

/Text/ MIISP /Moscow Institute of Agricultural Engineers imeni V. P. Goryachkin/.

Malfunctions in .38 kV rural electric power networks which are connected with a break in the wires, are very dangerous because a broken wire on the ground is under voltage and people and animals can be electrocuted. In addition, the incomplete phase operation leads to the malfunction of the electric motor load. According to available data more than 40 percent of the emergencies in these networks are due to phase breaks. The safeguards in these networks are unable in the majority of cases to pinpoint the emergency since the broken wire frequently falls on fences and structures rather than on the ground.

The MIISP has developed a new device for monitoring line breaks in .38 kV rural power networks. The functioning of this device, which is installed at the end of the shielded line, is based upon the creation of an artificial short circuit in the network, which is switched off at the beginning of the shielded wire by an automatic circuit breaker.

The actuating mechanism of the device looks like a mechanical (Fig 1) or combined (Fig 2) short circuiting device.

The active capacity filter with a reverse sequence voltage R1, R2, C1 and C2 is used as the basis for the guage which monitors the line break. The responsive mechanism of the device contains an operating amplifier A1, to the inverter input of which is connected a circuit R3-C3 which determines the endurance of the A1 comparator's deterioration. A reference voltage from the V6 stabilitron is fed into the non-inverted inlet of the comparator. The amount of this voltage and the setting of deterioration of the operating amplifier A1 is

changed by a resistor R6. An electromagnetic relay K2, which performs the role of an input relay for the actuating mechanism of the device, is connected to the outlet of the comparator A1 through the transistor V8.

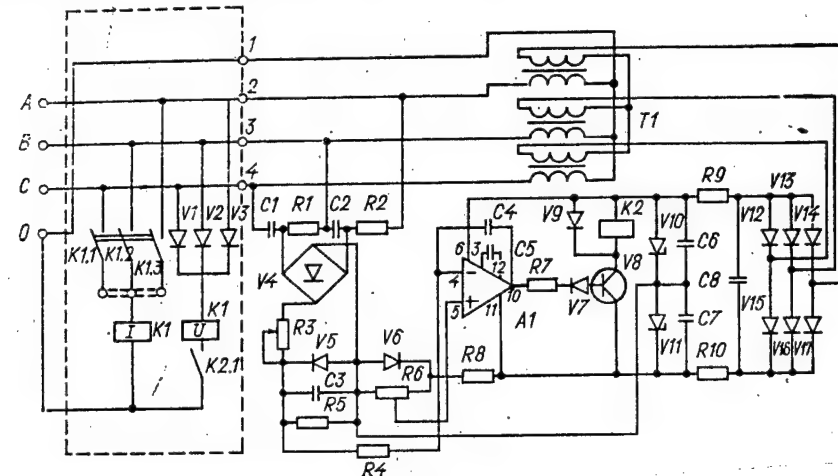


Fig. 1: Basic layout of a device for monitoring line breaks with a mechanical short circuit device.

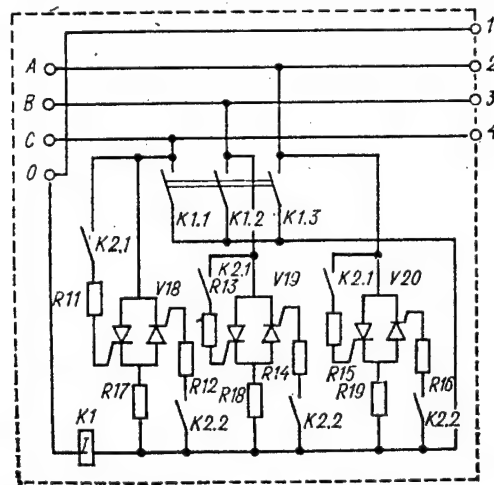


Fig. 2: Basic layout of a combined actuating mechanism of a device for monitoring line breaks.

The actuating mechanism receives power from a unit consisting of a transformer T1, a rectifier V12-V17, filters C8, C6, C6, R9 and R10, and stabilitrons V10 and V11.

The actuating mechanism contains a mechanical short circuit device K1.1, K1.2, and K1.3 with two coils K1: the rectifier V1-V3 is fundamental in voltage and additional in current and is three-phase. The combined actuating mechanism contains both a mechanical (K1.1, K1.2, K1.3) and a semiconductor (V18, V19, V20) short circuit devices with control circuits R11, K2.1-R16, K2.2 and current limiting resistors R17-R19.

When there is a line break in the network a signal is fed into the inverter inlet of the comparator A1 from the reversed sequence voltage filter through the rectifier bridge V4 and the delay circuit R3-C3. When the voltage at the inverter inlet exceeds the voltage at the non-inverted inlet, there is deterioration of the actuating amplifier A1, as the result of which the electromagnetic relay K2 shorts its contact K2.1 in the feed circuit of the basic coil of the short circuit device K1, which fails (the K1.1, K1.2, and K1.3 contacts short) and creates an artificial twophase short to the ground and then self-contains using an additional current short circuit coil prior to being switched off by an automatic switch that is installed at the beginning of the shielded line, from the action of the shielding.

When using a combined actuating mechanism in the device, its operation is accomplished in the following manner. As the result of the deterioration of the relay K2 of the actuating mechanism of the device (Fig 1), its contacts K2.1 and K2.2 (Fig 2) are shorted in the control circuit of the threephase semiconductor short circuit device V18-V20, as the result of which the thyristors are opened and permit the current pulse of the twophase short to pass, which, while proceeding through the current coil K1, puts the mechanical short circuit device into operation K1.1, K1.2, and K1.3. This shorts its contacts and shunts the circuit with the semiconductor short circuit device and then also self-contains using the current coil prior to switching the line off by the lead shielding.

The use in this case of a semiconductor short circuit device makes it possible to prevent the scorching and sealing of the contacts of the mechanical short circuit device because its switching on takes place in conjunction with a sharp reduction in voltage as the result of the operation of the semiconductor actuating mechanism.

After the line has been shut down by the circuit breaker installed at the beginning of the shielded line, the device automatically returns to the initial position.

This device makes it possible to provide reliable protection from line breaks in .38 kV electric power networks. It has been subjected to successful production testing and adopted for use in .38 kV power networks belonging to the enterprise of Moldglavenergo southern networks.

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PIPELINE CONSTRUCTION

UDC 553/621.643.002.2

PROBLEMS OF BUILDING PIPELINE GRIDS AT MIDDLE OB OILFIELDS TOLD

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 9, Sep 82 pp 17-19

[Article by V. M. Pavlyuchenko (Glavtyumentruboprovodstroy, Surgut): "Problems of Developing Pipeline Construction at Middle Ob Fields"]

[Text] Glavtyumentruboprovodstroy [Main Administration for Pipeline Construction in Tyumenskaya Oblast] has four integrated pipeline construction trusts, an Orgtekh-neftetruboprovodstroy [State Trust for the Industrialized Construction of Oil Pipelines], a materials and equipment supply office, an automotive transport office, an operating repair base, and other elements. The workload of the pipeline construction trusts depends primarily upon the state of development of the production associations of the main client--Glavtyumenneftegaz [Main Administration for the Production of Oil and Gas in Tyumenskaya Oblast]. The trusts and the production associations were established simultaneously.

For the "old" trusts--Surguttruboprovodstroy [Surgut Pipeline Construction Trust] and Samotlortruboprovodstroy [Samotlor Pipeline Construction Trust]--a major portion of the work at the fields is associated with reconstruction of the petroleum recovery systems: the laying of additional oil and gas lines and expansion of the grid of low- and high-pressure water mains.

The buildup of petroleum-field pipeline construction associated with the start of work at fields that are new and, as a rule, remote, has increased the work program relative to the "young" trusts--Yugansktruboprovodstroy [Yugansk Pipeline Construction Trust] and Kholmogortruboprovodstroy [Kholmogory Pipeline Construction Trust]. The erection of pipeline grids that will support an intensification of oil recovery--water-line systems for the maintenance of formation pressure (PPD) and high-pressure gas lines for gaslift recovery of crude--have an important place in the building up of the fields' facilities. Thick-walled pipe, designed for an operating pressure of 12-32 MPa is being used at them.

The creation of a ramified pipeline grid for gathering casing-head gas and the laying of gas and product pipelines from gas-treatment plants are extremely important. The gathering and treatment of casing-head gas at oilfields provides an economic benefit comparable with the benefit obtained from oil recovery.

On the whole, pipeline construction at the fields is characterized by great operating diversity (see the figure) and complexity. This complexity is occasioned by the numerous intersections with roads and utilities and communications lines at the existing operating fields and a lack of development of the region of construction

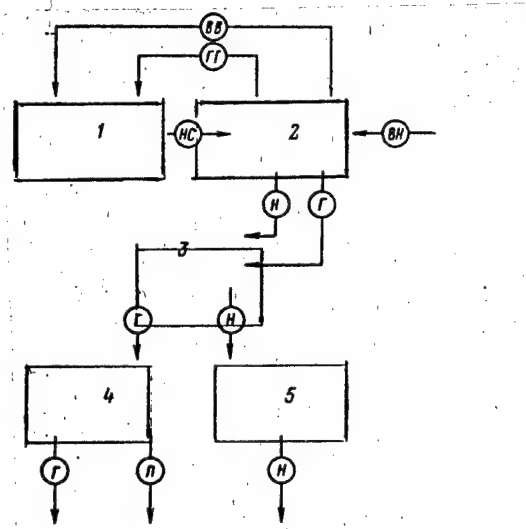
when starting work at new fields. As a rule, the pipelines have to be laid in places where there are lakes, swamps and numerous intersections with streams and where there is a high stand of ground water. In northern regions, areas of ground that have been frozen for many years must be mastered.

Functional Scheme for Pipelines at Oilfields.

Key:

1. Clusters of wells.
2. Combined site (DNS [booster pumping station], KMS [cluster-well pumping station] and KS [compressor station].
3. Central gathering facility.
4. Gas treatment plant.
5. Central commodity tank farm.

- BB. High-pressure water lines.
 ГГ. Gaslift gas lines.
 HC. Oil-gathering grid.
 BH. Low-pressure water lines.
 H. Oil line.
 Г. Gas line.
 П. Product line.



The buildup of field facilities is, as a rule, entrusted to a cost-accountable integrated section. At the start of winter (in October), the chief of the section and the brigade leaders undertake to draw up a protocol and schedule of operations jointly with the client--the OKS [Capital Construction Section] of the appropriate oil and gas recovery administration. Depending upon the amount of specialized work, the subcontracting administration allocates the corresponding resources in accordance with the agreed schedule. The road-construction brigades and the specialized administrations (for earthmoving work) conclude an agreement for a start-to-finish contract with an integrated brigade for the welding and insulating operations. Such a scheme of organization provides a rational workload for subunits and optimal flexibility of the production resources. All this promotes execution of the main task of contract construction--timely introduction into operation of the facilities being built, at minimum expense. The amount of uncompleted construction work at the fields was 40 percent less at the start of 1982 than on the corresponding date of last year.

The Glavtyumentruboprovodstroy collective's construction of trunk pipeline will increase in volume during the 11th Five-Year Plan. In 2½ years more than 1,200 km of oil pipeline are to be laid from Tyumenskaya Oblast to the country's European portion, and the main thing is that this must be done without the enlistment of pipeline construction subunits located in the country's central and northern regions.

Specialists of the main administration and its subunits have developed a design for organizing construction. A scientifically valid table for equipping one cost-accounting integrated construction section with machinery has been taken as the basis of the design.

The increase in construction and installing work requires more rational use of production funds and the adoption of measures aimed at providing for a maximum workload for production capacity. Such a problem can be solved where the machinery inventory

corresponds to the structure of the operations. Since a substantial proportion of the work involves small-diameter oilfield pipelines, determining the requirement for machinery per estimated 1 million rubles' worth of construction and installing work (SMR) gives clearly understated results.

The volume of the most labor-intensive work (for example, preparatory and earthmoving work) depends but little in some cases upon the diameter. For example, when building water lines 325 mm in diameter, the amount of earthmoving work is comparable to the amount performed when laying trunk gas pipelines 1,420 mm in diameter, because the water lines are laid much deeper.

Incorrect formation of the machinery pool leads to a lag in earthmoving work behind welding and assembly work by an average of 600 km per year. Obviously, standards for technical equipping should be developed that take account of such factors as length and diameter of the pipelines and complexity of the route. The factor of route complexity should reflect the frequency of intersections with natural and man-made obstacles, swampiness, the amount of forest, the presence of streams and lakes and so on.

And other indicators that are important to the main administration, particularly ceilings on manning and appropriations for upkeep of the administrative staff, are determined as functions of the amount of work, in terms of cost. It has been proved that the amount of managerial work depends not so much upon the cost of the jobs as upon the number and length of them. In view of the relatively small cost of pipeline facilities built at the fields, the expenditures for engineers' work per 1 million rubles' worth of construction and installing work here is many times higher than, for example, for laying large-diameter trunk pipelines.

Planning organs do not always make a differentiation in the expenditures for managerial work. As a result, the administrative subsystem of pipeline construction in the oil-bearing Ob region works under a considerable overload.

It is planned to rationalize administrative work and to cut down on noneffective paper shuffling at the main-administration level. This should be based on the wide introduction of modern office equipment, communications and means for obtaining, transmitting and processing information, with gradual conversion to the "Glavk" ASU [automated control system]. Since client enterprises and local Stroybank institutions of the Middle Ob regions are supplied with a ramified system for computer support, there is a prospect for creating a consolidated data bank and system of machine-adapted documents for shaping the production program, financing contract construction and reporting, accounting for and analyzing economic activity.

Equipment and procedures for systems paper work acquire special importance: particularly for the processing, filing, retrieval and mass reproduction of texts of specific documents, as well as systems for communications, including internal and external channels for transmitting information.

The highly efficient use of production resources over the whole calendar year is a serious problem. It must be considered that the summer season is the most suitable time for carrying out such operations as creating a production base and making preparations for the winter. Technical equipment that is not adapted for work on a flooded route should be sent to repair facilities by the start of the summer.

In our opinion, because preparation of the equipment pool has not been completed by the start of the winter season, the pace of work on the line is cut almost in half. In the summer, the resources that have been released to the route should be used to create an in-house production base. Production bases enable the workload of line subunits to be increased. For a new trust that is performing work in an undeveloped area it is desirable to plan the workload as follows: for 3 years--30 million rubles' worth; for 5 years--50-60 million rubles' worth; and for 6-7 years--70-80 million rubles' worth.

In the summer various technological processes can be carried out on specially reserved sections. The sections of the route to be built in the summer and those to be built in the winter should be determined previously, based upon the results of study of the route and an analysis of the design papers.

Where there are many stream crossings, it is desirable to convert operations to a special summer technology, using special construction machinery with increased off-the-road capability. Based upon 3 years of experience, an optimal collection of machines for building pipelines within oil and gas fields was identified: a basic set (or module) and a supplementary set that is specified as a function of the working conditions.

The basic set includes four snow or swamp buggies, four single-bucket excavators on swamp-going chassis, four or five pipelaying cranes, four bulldozers with traction that is based upon the T-100MB swamp tractor, two skidding tractors, three self-propelled welding installations, and six all-terrain vehicles (four GT-T's and two GAZ-71's).

Working conditions and the number of additional machines required for them are shown in the table.

Supplementary Set of Machinery for Construction During the Summer

Working conditions	Machines and mechanisms	No
Gas pipeline construction	Snow or swamp buggies.....	2
	Dump trucks.....	2
Where more than 30 percent of the route's length is swamp	MTP-71 excavators.....	4
	Swamp and skidding tractors.....	4
Where there are more than five intersections over existing pipelines, per 10 km	MTP-71 excavators.....	2
	D-694 bulldozers.....	2
The intersection of an open body of water at lakes	BMK launch.....	1
	T0-1224 pipelayers.....	2
	Swamp tractors.....	2

In the Middle Ob region it is required, on the average, that four supplementary sets per four modules, which will support an estimated 30-35 km complex of line work for one cost-accountable outfit, must be manipulated.

Along with organizing year-round construction of the linear portion of pipelines where there is flooding and swampland, the main administrations take measures to

reequip organizations with machinery and to introduce progressive work methods. Highly mechanized and productive BTS-142B installations for two-sided submerged arc welding will be used for the first time in building trunk oil pipelines.

A substantial increase in labor productivity for welding work will be provided by the wide use of resistance welding on small-diameter pipelines (325 mm or less). The main administration's subunits are now operating five lines for the resistance welding of pipe (TKUS-1A's and PLT-321's). Later their number will be increased to 10.

In 1981 resistance welding was performed on 205 km of pipelines, last year this was increased to 650 km. It is planned to convert in 1985 entirely to the use of this welding method for building small-diameter pipelines at oil and gas fields, primarily for gaslift systems for recovering oil at the Samotlor and Fedorov fields.

A great step in developing resistance welding is the creation of mobile installations equipped with the K-584M welding head, mounted on a chassis with high off-the-road capability. It is planned to make large-scale use of such installations by the end of the 11th Five-Year Plan, to cover 98 percent of all welding work during pipeline construction at the fields.

PTL-2 bench insulation lines are working in unison with PLT-321 resistance welding lines. It is proposed that by 1985, 99 percent of the insulation work performed on small-diameter pipelines will be done on bench insulating lines.

A number of construction tasks at the fields require scientific study on an industry-wide scale. The lack of due scientific support for the technology and organization of erecting at the fields pipelines with pressures higher than 10 MPa (PPD and gaslift lines) compels the main administration to divert substantial engineering forces to the solution of production tasks.

Glavtyumentruboprovodstroy has developed a wide program of involvement with scientific-research and design organizations on a bilateral basis. A long-term agreement has been concluded on collaboration with the Tyumen Branch of the Gazstroy Mashina SKB [Special Design Bureau]. Its preparation took into account a maximum combining of the development, fabrication and testing of new technical resources. A single-bucket swamp-going excavator and swamp-going drilling crane based on a skidding tractor have been created by joint efforts. It is planned to use widely various basic models to create sets of small machines and small equipment complexes for pipeline construction in swampy regions.

Measures aimed at further raising labor productivity and work quality are being developed jointly with institutes of the Siberian Department of the USSR Academy of Sciences, vuzes and scientific and design organizations of Tyumenskaya Oblast.

The main administration is paying great attention to developing large-scale socialist competition for a worthy greeting to the 60th anniversary of the forming of the USSR by reaching a daily recovery of 1 million tons of crude and 1 billion cubic meters of gas.

Economic substantiation, devotion to the integrated solution of tasks, and, the main thing--the turnover of completed facilities, have become typical features of the socialist commitments undertaken by the subunits.

Many of the main administration's collectives are operating successfully. These include the brigades under USSR State Prizewinner V. F. Kalenov (Construction Administration No 8 of Surguttruboprovodstroy), Hero of Socialist Labor M. G. Amvros'yev (Construction Administration No 10 of Yugansktruboprovodstroy), P. A. Malikov (Construction and Installing Administration No 52 of Kholmogortruboprovodstroy), and others. All the advanced brigades are working under cost accounting, by means of which half of the main administration's construction and installing work volume is being accomplished.

The main administration's labor collective are devoting all their efforts to the successful completion of 11th Five-Year Plan tasks.

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PIPELINE CONSTRUCTION

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STEPS TAKEN TO IMPROVE PIPELINE RELIABILITY IN WEST SIBERIA DESCRIBED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 9, Sep 82 pp 6-8

[Article by A. M. Zinevich, VNIIST [All-Union Scientific-Research Institute for the Construction of Trunk Pipelines]: "Raising the Reliability of the Pipelines That Are Being Laid in West Siberian Regions"]

[Text] The quality (or reliability) of gas pipeline systems is shaped as an integrated characteristic at the various stages of their creation--survey, design and construction--and it is maintained during the operating process.

The requirement for quality in facilities that are being constructed in areas with extreme soil and climatic conditions, such as West Siberia, is especially sharp. Complicated gas pipeline systems of the greatest capacity and, from a design standpoint, complexity, which have no counterparts in world practice, are being laid down and operated here. Their uninterrupted operation is of the greatest importance to the national economy.

Under Siberia's complicated conditions, where thousands of kilometers of trunk and oilfield pipelines are now operating, transporting a major portion of the gas recovered in the country, problems of reliability and effectiveness of gas transport have acquired paramount significance. It should be emphasized here that reliability and effectiveness are functions primarily of three independent variables taken together in harmony: the quality of design, the quality of construction, and the quality of operation.

Poor quality in execution of the work at one stage or another leads to a reduction in operating reliability of the facility as a whole and can be the cause of breakdowns.

West Siberian gas pipelines are 15 years old or less. During their operation, the breakdowns that have appeared were caused by the following: violation of the technology of the welding and assembly work, pipe defects, loss of stability of the pipelines at swampy or flooded sections, insufficient ballasting and anchoring, deviation from design decisions, and defects of the design decisions themselves, which did not consider fully the forecast of changes in the environment and actual temperature differentials during construction and operation. Breakdowns for the reasons named were observed also on pipelines that have been laid in other parts of the country, but the losses of stability were characteristic primarily of West Siberia. Incompleteness of our knowledge in the area of interactions of the pipelines and the environment is a factor in the indicated causes.

In order to raise the quality and reliability of pipelines at the construction stage, the industry has developed and implemented a science-and-production program for the 11th Five-Year Plan. This program was founded on scientific research conducted by institutes of the USSR Academy of Sciences and the Ukrainian SSR Academy of Sciences that was aimed at developing a theory of reliability, as well as a theory of durability, relative to the large-diameter pipelines that are being erected in West Siberia, and improving methods and equipment for welding and monitoring and for integrated protection against corrosion, including prognoses of the service life of the insulating materials, the technology for applying them, optimal parameters for electrochemical protection, and so on.

Within the industry's science-and-production program, the following principles are primary: quality cannot be provided only by monitoring--it should be incorporated in the technology, in the hardware. Quality-monitoring functions are being transformed into quality-controlling functions.

The program's measures are to perfect: the technology of construction, of mechanization equipment, of structure and of the integrated-module method for the construction of surface structures; the organization of an industrywide quality-control system and an organizational structure for the monitoring services; the materials and equipment base for monitoring and for metrological support of construction; the system for raising the skill levels of those who do the work and the system of material and moral incentives for them; and the whole mechanism of the industry's production-economics activity.

The program calls for a reduction in breakdowns of the pipelines' constructional members: the pipe, the welded joints, insulation coatings, and means for electrochemical protection, as well as the means that provide for the stability of pipelines in the designed position.

The main areas for improving pipeline-welding technology (and that also means a rise in its quality) and its productivity during the 11th Five-Year Plan are the development of pressure methods with the simultaneous shaping of the joint about the whole cross-section, and the perfecting of arc methods with positive joint forming and of two-sided automatic welding.

An analysis of the malfunctions of welded joints, including those of pipelines that have been laid in West Siberia, indicated that a third of them had occurred because of poor penetration of welds that were made by automatic submerged arc welding, because of operating violations during manual arc welding (mainly during the performance of special operations: the welding of sags, reducers, branches, fixtures and so on). In order to preclude such deficiencies, pipe-welding bases with manual backup of root joints were replaced by BTS-143 type bases for two-sided automatic welding and by PLT types bases for resistance welding. This enables the number of defects to be cut almost in half.

During the 11th Five-Year Plan, wider use will be made of pressure (resistance) welding, the share of which in the total welding volume should be 30 percent. This method provides stability in the properties of the welded junction by the simultaneous forming of the weld throughout the whole cross-section and by a program for regulating the operating process.

High-quality arc welding is being attained at low ambient temperatures thanks to the use of special welding materials (electrodes, wire and fluxes) and a technology that considers the temperature of the air and of the pipeline being welded that VNIIST developed.

Conversion from the manual nonrotary welding to welding with fluxed-core electrodes, with positive shaping of the joint by Styk-type installations, which were developed by the Institute of Welding imeni Ye. O. Paton, VNIIST and the Kiev Branch of the Gazstroymashina SKB [Special Design Bureau], enables the number of defects committed during overhead welding, which is now performed manually, to be reduced to a minimum.

Automated welding volume will reach 70 percent by the end of the five-year plan. A system of duplicate monitoring of welded junctions of pipelines by means of ultrasonics will be introduced. This system is already being introduced into pipeline construction in West Siberia.

A number of other measures must be implemented in order to further improve welding quality.

More productive use of resistance-welding units must be provided for. USSR Minchermet [Ministry of Ferrous Metallurgy] should raise the quality of the welding materials being delivered. The output of copper-clad wire for welding pipe made of higher-strength steel must be increased. Wire that is not copper clad is susceptible to corrosion, and its use can cause porosity in welded joints.

The time has come when USSR Minchermet must organize specialized departments or sections that will produce welding materials in the amounts required for the construction of trunk-type pipelines and will repair them.

Because of the rising amounts of welding work (2 million joints were welded and 4,000 tons of metal were fused on in 1975, and in 1985 these amounts will be raised, respectively, to 3 million joints and 9,000 tons of metal) and the great influence of welded-junction quality on the constructional strength and tightness of gas pipelines, VNIIST will expand and intensify research in the field of the reliability of junctions and it will take an active part in joint work with the Institute of Electrical Welding imeni Ye. O. Paton on the reliability of junctions made with resistance welding.

Such elements as insulating coatings and means for electrochemical protection have a basic place in insuring the constructional and operating reliability of pipeline systems.

In the area of anticorrosion protection, the ministry's engineering policy is aimed at providing integrated protection for pipelines and the wide use of factory-applied insulation for large-diameter pipe (1,020-1,420 mm).

Polymer films, which have their virtues and deficiencies but which possess significant advantages over bituminous coatings in both the construction and operating stages, are now the basic type of insulation.

At the construction stage the requirements for cleaning the surfaces of pipelines, observing the technological requirements for preheating the pipelines in winter,

providing the required degree of tautness of the film, maintaining the prescribed amount of overlap, preparing the bottom of the ditch, and so on, have now risen. Exceeding the temperature limits for film coatings and the emergence of exposed sections, which leads to acceleration in aging of the coating, cannot be permitted during the operations.

The results of experimental and full-scale research have enabled the protective and mechanical properties of film coatings to be improved by an increase in adhesive strength and by provisions for stability thereof during construction and operation. Protective-film thickness has been increased by 30 percent. All film coatings are being used with wrappers and, to a great extent, with sticky wrappers.

A study of the actual working conditions of the coatings and of their design, based upon polymer films and wrappings with a glued layer, has enabled the creation of wrappings that relieve the coating's protective layer of the shifting forces that the soil exerts on the pipeline. The wrappers themselves absorb both the forces and the deformations, thereby reducing to a minimum during operation the possible shifts in the coating's protective layer.

In order to increase the reliability of protection of pipeline sections that operate at temperatures above 50 degrees C, heat-resistant organosilicon insulating films have been created jointly with NIFKhI [Scientific-Research Institute for Physical Chemistry] imeni L. Ya. Karpov. Industry has mastered production of them, and this has, in essence, solved the problem of insulation for hot pipelines.

Inhibited primers have been developed that practically preclude corrosion under the film. The primers possess high resistance to the effects of moisture and high temperatures, and they have great adhesiveness.

Joint research by the Petrochemistry Sector of the UkSSR Academy of Sciences, Ukr-NIiplastmash [Ukrainian Scientific-Research and Design Institute for the Development of Machinery and Equipment for Processing Plastics, Resins and Artificial Leather] and VNIIST has enabled a heat-setting film and the technology for its production to be developed. Test production of this film will be organized in the first half of 1983.

All the indicated developments and their industrial realization will enable the potential of film coatings to be appraised in a different way.

Based upon the results of many years of comprehensive research by VNIIST, with the participation of USSR Gosstroy and Minnefteprom [Ministry of Petroleum Industry] and Mingazprom [Ministry of Gas Industry] scientific-research institutes, a special GOST [State All-Union Standard] (a development of the 1974 GOST) for the protection of trunk pipelines has been developed and presented to the Committee for Standards. It reflects in quantitative indicators such criteria of reliability as thermal stability, water resistance, cathodic separation, transient electrical resistance, temperature standards for physical and mechanical properties, biostability, acceptance monitoring, and other criteria, as well as the parameters for electromechanical protection, the quantitative requirements therefor, and so on. Introduction of the new GOST will raise the quality and reliability of integrated protection and establish valid requirements for these important constructional elements of pipeline systems during design, construction and operation.

There have been practically no breakdowns on West Siberian gas pipelines caused by soil corrosion, even on pipelines that have now been operating for 15 years (a case of corrosive breakdown on a gathering grid at one of the oilfields after 7 years of operation was caused primarily by the arrival in the ditch from an industrial area of highly mineralized water effluent that contained more than 1,500 mg/liter of chlorides, which caused pitting-type corrosion). Does this mean that West Siberia has no problems in providing protection to pipelines against corrosion? There are problems, and they are rather complicated. The first problem is that of averting the baring of insulated sections of gas pipelines. A number of sections of substantial length have been in such a state for a long time, and this causes damage to coatings (such as on the gathering lines at one gas field). The repair of these sections is required, including the application of a new insulation coating.

VNIIST has developed for West Siberia's freezing conditions technical systems for the electrochemical protection of oilfield structures and trunk pipelines, based upon the results of studies of the minimal protective potentials and the electrical current distribution on a pipeline with a halo of thawing ground around it. The coefficients of increase in the protective potential necessary for providing full protection in a concentric anisotropic environment have been established. It was pointed out that where there is "thawed ground" around a pipeline, cathodic polarization is provided for the pipe by means of a cathodic installation with concentrated anodic grounding. The effectiveness of electrochemical protection increases with use of elongated protectors or elongated anodic groundings, which were also developed by VNIIST. The results of the research that has been conducted afford integrated protection of gas pipelines in "thawed ground" during the operational period.

Based upon the specific conditions for the construction and operation of gas pipelines in West Siberia and the necessity for more complete provisioning of quality and reliability of anticorrosion protection, it is desirable that primarily pipe with factory-applied insulation be sent to this region and to other regions, and to the hot segments of gas pipelines (downstream from the KS's [compressor stations]).

Insuring stability is central to the problem of raising the reliability of West Siberia's gas-pipeline systems.

The stability of a pipelines means, in essence, keeping its position at the designated grade level throughout the entire period of its operation.

An analytical methodology and a mathematical model developed by VNIIST consider all the effects on the pipeline as being exerted on a system that consists of sections that are under different stresses. This methodology was realized jointly with Mingazprom design organizations in the form of programs for computers, and it is being used successfully. It reflects the state of the art. As with many other developments, it can and must be improved. But the question is, primarily, what initial data is to be incorporated for computation! The basic cause of loss of pipeline stability is concealed precisely here. The computation does not include the actual temperature differentials, since the forecast of change in the properties of the soil medium and the degree of flooding of sections on the route was not fully considered. Therefore, even the construction solutions that were carried out according to the design cannot cope with the actual conditions on all sections of the route.

The actual temperature differential reaches 70-75 degrees C in some places instead of the computed 58 degrees C. The longitudinal forces from the temperature effects in such cases are 34 percent more than computed. These can be reduced to the computed values by cooling the gas and using packing systems, including an underground system, with compensating structure or other means.

The establishment of some kind of optimal temperatures for the construction is unfounded and unrealistic. It is known that the main construction season in West Siberia is the winter. Operations are conducted at temperatures down to -35 degrees C. The selective conduct of operations (as is laid down in the designs) at temperatures in the -18 to -30 degree C range reduces the winter construction season by 3 months, for a total duration of 5 months. Meeting the construction deadlines of the directives requires full use of the winter season. Such a situation also contradicts official decisions about year-round construction of pipelines.

Longitudinal forces caused by temperature effects can be reduced, particularly by the underground laying of the pipelines with compensational means. Such a solution is especially effective where parallel gas-pipeline strands are to be built. For permafrost conditions, pipeline stability can be insured by cooling the gas, and, where there is intermittent freezing, by thermal insulation, which prevents heaving on thawing sections.

The ditch itself and the backfill soil that covers the structure are constructional elements that determine pipeline stability.

Right now, in order to secure gas pipelines at the designed grade levels, screw anchors and reinforced-concrete hold-down weights are being used widely. The most rational types of them and the areas of their use have been defined. Calculation of the load-bearing capability of screw anchors is governed by the requirements of SNiP II-46-75. Soil of different physical-engineering characteristics have been reduced to groups, for each of which the critical loads on the anchors have been found experimentally.

Determining the load capability of the anchors in accordance with SNiP II-17-77, "Pile Footings," is, in our view, undesirable for West Siberia's soil, since the computed data obtained does not jibe with the results of experimental research and monitoring measurements conducted in West Siberian regions.

The improvement of reinforced-concrete hold-down weights is moving in the direction of an increase of their unit weight (the use of heavy concretes). The production of heavy concrete based upon copper-ore slags must be boosted.

Until recently not much attention had been devoted, especially in West Siberian regions, to the use of poorly consolidated soils for ballast. This method of ballasting has now passed through the stage of industrial-test use in two variants: physical-chemical treatment of the soils, with a view to converting them into consolidated soils, and the use of nonfabric synthetic materials to impart stable ballasting properties to the soils. Already this year Glavvostoktruboprovodstroy [Main Administration for Pipeline Construction in the Eastern Economic Region] will ballast about 6 km of pipeline in river floodplains with local soil treated with effluents from cracking production. In Urengoy about 2 km of gas pipelines have been ballasted with soil, using synthetic materials. It is important that these new solutions begin to be used on the lines.

There are now various constructional solutions for laying gas pipelines where there are poorly consolidated or flooded soils or permafrost. These include under-ground laying and semiunderground, surface and above-ground laying of the lines. They differ from each other primarily in level of stressed state and in the equipment for construction and operations (the degree of cooling, thermal insulation, ballasting arrangements, and the solution for foundation supports--including thermal piles, soil fill, the nature of compensation, and so on). Some degree of restriction is characteristic of each. Therefore, variation in design is required.

Where an area is high in pipeline density (in the corridor system and at gas fields), it is obvious that, in the case of poorly consolidated soils, underground laying in combination with compensational means and a definite degree of cooling of the gas are desirable. For solitary trunk gas pipelines or a sparse grid of pipelines at gas fields, surface laying with compensational constructional structure is suitable. Under permafrost conditions, it is rational to use underground laying, to cool the gas to soil temperature, and to use thermal insulation, and also (depending upon the conditions, including the local terrain) to lay the line's supports with thermal piles, or a combination of underground and above-ground laying.

It should be emphasized that gas pipelines perform a set of functions, since they comprise transporting trunk lines, sealed reservoirs and elongated high-pressure boilers, and welded structures. They are in a complicated state of stress. Therefore, it is extremely necessary to have at gas pipelines an automated system that will forewarn about the appearance of dangerous levels of stresses and deformations, including those caused by possible corrosion processes. This task is complex, but its solution is not being achieved actively enough.

No country in the world but ours has such substantial scientific bases, engineering solutions and experience in the design, construction and operation of gas pipelines in swamps and flooded areas. Thousands of kilometers of high-capacity gas pipelines have been built in West Siberia, including those built in the permafrost soils of the North. This experience is the basis for raising the quality and reliability of gas pipeline-transport systems.

This experience will be considered in SNiP II-45-75, "Trunk Pipelines," which is being revised, as are USSR Gosstroy Instructions on the Design of Steel Pipelines for Crude Oil, Gas, and Gas Condensate Fields and for Underground Storages and its Instructions on the Construction of Pipelines at Oilfields.

More active joint work by NII's [scientific-research institutes], KB's [design bureaus] and Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] and Mingazprom design and production organizations that is aimed at raising the quality of design, construction and operations will enable the reliability of the functioning of gas pipeline systems of West Siberia and the North to be raised.

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PIPELINE CONSTRUCTION

MOSCOW PAPER DISCUSSES PIPELINE CONSTRUCTION

Moscow SOVETSKAYA KUL'TURA in Russian 21 Sep 82 p 1

[Article: "Gas Pipeline Under Construction"]

[Text] The economic potential of the country is rising, and the power available per productive laborer is improving in all sectors of production. These factors advance the development of the fuel and energy complex into the most urgent problems of the national economy. Developing the riches of the depths, the Soviet people are going farther for oil and gas, into the uninhabited and difficult-to-reach regions of Siberia and the Far East.

"It remains to make extraction of oil and gas in West Siberia, and their transporting to the European sector of the country the most important links in the energy program of the 11th, yes and even the 12th Five-Year Plan," Comrade L. I. Brezhnev stressed at the 26th CPSU Congress.

It has been stipulated in the 11th Five-Year Plan that six large gas pipelines will be laid from the northern Tyumen Oblast into the central regions of the country. The total outlays for construction of these trunklines will exceed the cost of construction of Kam AZ [Kamchatka Automobile Plant], BAM [Baykal-Amur Trunkline], VAZ [Volga Automobile Plant] and "Atommash" taken together. The Urengoy-Ukhta-Moscow and Urengoy-Petrovsk gas pipelines have already been put into operation. Construction of the gas trunkline Urengoy-Novoposkov is being completed. Work is unfolding more broadly on the route of the export gas pipeline Urengoy-Pomary-Uzhgorod. Its length is enormous, 4,451 km, on the path of many complicated sections, water obstacles and mountain massifs. Nevertheless the information coming from the construction site indicates that the pipe layers are successfully overcoming these difficulties. On the entire length of the route in different republics and oblasts, well-built settlements are developing. Up to 12 kilometers of pipe are welded into lengths daily. In this case the calculated rates of work are being significantly exceeded. This is the best response to the attempts of the U.S. administration to interrupt construction of the trunkline.

A man living on the route soon feels himself the master of the land here and will work better if he feels concern of party, Soviet, trade union organizations for his daily life, for the cultural services. Thus daily life has been organized, for example in the city of builders of the Urengoy-Pomary-Uzhgorod gas pipeline located in the lowland of the Sury River where comfortable homes neighbor with

clubs, lawns, and neat sidewalks. There is just as attentive an attitude to the social and cultural daily life of the city of builders of the Transcaucasus administration for construction of pipelines which recently developed on the outskirts of the Transcarpathian settlement of Yasen'. In each of the 80 two-room houses there is modern furniture, refrigerator, television, and water heating. There is a sauna, cafeteria and cultural center, for the services of the workers, engineers and technicians. All the conveniences of city living have been provided in the settlements of the route workers of the trust "Tatnefteprovodstroy" in Pomary and Shemordan. Here construction of the gas pipeline route has ceased to be a synonym for unsettled, mobile life.

However this has not become the norm everywhere, unfortunately. After the builders the operators come to the trunkline as is known. Their needs for housing and facilities of social-cultural purpose are not yet satisfied completely. It is the fault of the Ministry of Construction of Oil and Gas Industry Enterprises, the USSR Administration of Heavy Construction, and the USSR Ministry of Construction that building of many settlements at the previously built routes, facilities of social and cultural services in West Siberia is being delayed. Of the 11 kindergartens and 7 schools which should have been built this year for workers of "Tyumengazprom," 8 facilities have not yet even been started in the first 6 months. The contractors as before often continue to consider the residential microregions, and buildings of cultural-general purpose to be facilities of second grade. The ministries and departments involved in construction and operation of the gas pipelines need to persistently struggle with this practice.

It is difficult to overestimate the positive role of the initiative of the builders of Moscow and Leningrad, Belorussia, and Ukraine, Estonia, Latvia, Lithuania and a number of oblasts of the Russian Federation who decided to help the Siberians in constructing housing and cultural-general facilities. This was greatly responsible for the fact that at the end of the year about a million square meters of housing will be built in the Siberian cities and worker settlements. New schools, hospitals, children's preschool institutions, stores, cafeterias, and cultural institutions will be built.

SOVETSKAYA KUL'TURA has already reported what help will be given to the builders in Udmurtiya, the Perm Oblast and Transcarpathia. All possible improvement in general and cultural servicing of the route workers is considered by the local party and Soviet agencies and cultural institutions to be their direct duty. Artists, painters and best amateur collectives, mobile libraries and exhibitions come to the route. Specially created oblast and republic headquarters supervise the cultural servicing of the builders.

Laying of the giant trunklines is the business of our contemporaries and compatriots. Behind the members which indicate the successful course of construction is impossible to forget about their needs. The duty of the party, Soviet, Komsomol agencies, institutions of culture and representatives of creative unions and the public of all oblasts and republics through which the route passes must do their bit for the national work. This is the guarantee that the word given to the motherland to open all the gas pipelines including the export on time, will be fulfilled by the builders with honor.

PIPELINE CONSTRUCTION

NEW ORGANIZATIONAL, WORK METHODS INCREASE LABOR PRODUCTIVITY

Moscow SOVETSKAYA RUSSIYA in Russian 5 Oct 82 p 1

[Article: "Trunkline Forward!"]

[Text] The first thousand kilometers of pipes have been welded into a length at the construction of the new gas transport system Urengoy-Pomary-Uzhgorod. The construction and installation subdivisions of the USSR Ministry of Construction of Oil and Gas Industry Enterprises, having defined the planned schedules, have fulfilled one-fourth of the welding operations on this unique gas pipeline. How has this labor victory been attained? The editorial staff asked the deputy minister A. Vesel'yeva to answer this question.

The success is based on breaking the traditional forms of control whose imperfection was revealed as the technical might of our subdivisions grew. It is enough to say that in the last 2 years alone the power available per productive worker at the work sites doubled. It has become difficult to supervise the complicated multiple-sector industry, the more so because each collective was responsible only for its own local task and essentially was indifferent to the business of the neighbor. We tried to get rid of this separateness, by creating a new structure of control. Today the welding, preparatory, insulation and many other sections have been reduced to a single production line. Now everyone is concerned only about one result, the final, the start-up of the finished pipeline. And as a result there has been a drastic increase in labor productivity. Whereas previously it was considered an achievement to lay 15 km of pipe in a month, now we have become accustomed to much greater results. For example take the production line of the trust "Novosibirsktruboprovodstroy". It counted 25 km in September. But as it turned out this was not the limit: the production line of the trust "Mosgazprovodstroy" laid 32 km during this month.

Of course the new system of control would not have brought the desired result if the organizational changes had not been accompanied by an energetic search for new forms of socialist competition. We, for example, developed the order that each Monday results were summarized for fulfillment of the commitments and the weekly-daily assignments simultaneously over the entire route. This efficiency helps not only to reveal the winners and the laggards, not only to immediately morally and materially encourage them, but also to reveal, and this is especially important, the "tight" places, and to take emergency measures to

eliminate them. Here is a new example. At one of the last "Mondays" the head of the production line of the welding-installation trust V. Belyayev reported with concern that because of a shortage of pipes there developed a threat of nonfulfillment of the socialist commitments. As it turned out, the work rates on the section were so high that the planned quantity of pipes was simply insufficient. Together with the railroad workers, we gave the collective the necessary help, literally in 3 days brought in an additional number of pipes.

The basis of organization of labor on our sections today is the brigade contract which is linked with the Shchekinskiy method. For example, not so recently in the production line of the trust "Kuybyshevtruboprovodstroy" there were over 400 people working. Today there are 260. The volume of work has not diminished at all, it has even risen. Each one has begun to work more effectively. In addition to everything else this has been helped by stimuli: in order to increase the interest of the workers in the final result, we have introduced wages on a single contract in the comprehensive lines.

Let me say several words about the future. Today, as the readers already know, the main construction-installation operations are done in the section from the Urals to the western boundary. With the onset of winter, the Siberian trusts will begin their operations for laying the gas pipeline. Their region is Urengoy-Urals. In a short period they have to lay there over 1000 km of pipe. I would like to stress that fulfillment of the set task depends not only on them, but also on the transport workers. The railroad workers, sailors and river workers must supply the planned number of pipes there, technological equipment, fuel and structural parts. We count on their help.

The labor collectives of the sector are confident that the socialist commitments adopted in honor of the 60th Anniversary of the USSR will be successfully fulfilled. The builders are full of decisiveness this year to lay no less than 2000 km of pipe.

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PIPELINE CONSTRUCTION

SEPTEMBER EXPORT GAS PIPELINE CONSTRUCTION REPORT GIVEN

Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 82 p 3

[Article by G. Veselkov: "In September on the Route"]

[Text] Last month became a noted stage in the life of the collectives of the Urengoy-Pomary-Uzhgorod gas pipeline builders. By 1 October on this not yet completely developed construction site the first thousand kilometers of pipeline were welded into a length.

September was characterized by the further increase in the rates of work which are being done with considerable advance of the approved schedule. For example, according to the schedule it was planned to weld into lengths 330 km of pipes in September, actually 482 were welded, it was planned to bring to the route 250 km of pipes, but 370 were brought.

In the previous survey (EKONOMICHESKAYA GAZETA, No 37) it was noted that in August high indicators had been attained in the most important types of work. In September these achievements were covered. Thus, whereas in August the builders succeeded in insulating 220 km of pipes, in September 295.

The successful work in September permitted the builders of the export gas pipeline to greatly cover the assignments of the third quarter of 1982 for all the most important indicators.

The route is "overgrown" with cadres: a 50,000 Komsomol-youth team has been sent here, the first groups of specialists from the GDR have started to work, new production lines are being formed because of rebasing of builders from the almost completed gas pipeline Urengoy-Novopskov. This had a positive effect on the work rates. Precise engineering preparation of production, introduction of the brigade method of organization and stimulation of labor, work on a unified contract bear their fruits.

Currently there are already 20 comprehensive lines and 28 specialized lines for welding operations working on the route. Among them competition is becoming more heated for laying no less than 1 km of pipeline per day. An example of this is the collective of the line headed by A. Buyankin from the trust "Mosgazoprovodstroy": in September it lengthened the route by 32 km. Some other lines, V. Maslakov ("Novosibirsktruboprovodstroy"), A. Pinevskiy ("Soyuzgazspetstroy"), V. Belyayeva (all-union welding installation trust), A.

Golubitskiy ("Krasnodartruboprovodstroy") are approaching the outlined goal. As in August, one of the winners of the competition is the collective of the line of the Transcaucasus administration headed by S. Gevorkyan. The collectives of the Main Administration for Pipeline Construction, Main Eastern Administration for Pipeline Construction, Main Southern Administration for Pipeline Construction, the all-union association "Soyuzintergazstroy".

Work is continuing at the compressor stations of the first phase. Field base cities and watch settlements are being developed. Unfortunately, some leaders are focusing more attention on production objects to the detriment of solving social-general questions. They are not preparing for winter cold and they should everywhere. These omissions should be eliminated. Ahead are important assignments of the fourth quarter. The attained rates should be strengthened in order to fulfill with honor the intensive socialist commitments.

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PIPELINE CONSTRUCTION

AZERBAIJAN PIPELINE SECTION PASSES INSPECTION

Yerevan KOMMUNIST in Russian 20 Oct 82 p 1

[Article by A. Shkulev: "Gas Pipeline in Operation!"]

[Text] The deputy head of the Transcaucasus administration for pipeline construction "Soyuzintergazstroy" R. Chakhmazov called the editorial staff of KOMMUNIST from Baku. He reported: the state commission had adopted into operation with an evaluation of "good" the 135-kilometer section of the main gas pipeline Mozdok-Kazi-Magomed which was built by the Armenian and Azerbaijan gas builders on the territory of the Azerbaijan SSR.

The Mozdok-Kazi-Magomed gas pipeline was a continuation of the super long distance gas trunkline Urengoy-Novoposkov. It will make it possible to guarantee stable supply of Siberian gas to the industrial enterprises and daily needs of the population of the fraternal republics of Azerbaijan, Georgia and Armenia. The output of the new gas pipeline is 10-15 billion m³ of gas per year, or 27-40 million m³ per day.

The subdivisions of the Ministry of Construction of Oil and Gas Industry Enterprises is currently completing construction of the gas pipeline on other sections of the route. It will be completely opened in the current quarter.

Of the 617-kilometer route of the gas trunkline Mozdok-Kazi-Magomed, the collective of the Transcaucasus administration of pipeline construction has been given the most difficult section in the foothills of the small and large Caucasus ridge. It passes through the territory of the Shemakhanskiy, Apsheron, Divichinskiy and Khachmasskiy regions of the Azerbaijan SSR, intersects numerous rivers, deep ravines and gullies, forest tracts and automobile roads, and rises to a height of 2000 meters above sea level.

Temporary roads and crossings for water obstacles have been built on the complicated mountain relief of the locality for bringing pipes to the site of laying. Special racks have been constructed in the steep sides for laying 23-meter lengths. In this case the energy of explosives and modern equipment was widely used: powerful pipe length carriers, rotary excavators, insulation and pipe laying machines, welding units.

In order to protect the pipes laid on the racks and in the trenches from mountain streams and landslides, "special clothing" was used--wooden lining of the pipes, rock connectors and water-removing retaining walls.

The gas trunkline was done by three collectives: Baku section (head V. Sarkisov), the Lavarev construction administration (head I. Kuznetsov) and the Abovyan construction administration (head G. Agadzhanian). They actively competed among themselves for achievement of high indicators, overfulfillment of the daily standards were guarantee of high quality. The head of the ZUS S. Kazanyan provided general supervision of the gas pipeline construction.

The brigades of the insulation-laying column of Lerman Ayrapetan, installers Ivan Sologub, electric arc welder Ivan Gulin and Mikhail Basov, machine operators of the welding unit Baba Musiyev and Zaven Pogosyan, driver of the insulation machine Oleg Lazarev, excavator operators Armenak Vanyan and Il'ya Melkumyan labored selflessly in friendly international collectives of gas builders.

The foremen of the construction section K. Ambartsumyan, excavating S. Babayan, and laying-insulation column A. Saakov provided bold and rapid supervision of the construction-installation work.

During the many years of work on routes of the gas pipelines, in the harsh mountain conditions, their nature has been forged, skill has been sharpened, and the ability to overcome any difficulties and obstacles has been developed. They are successfully solving complicated engineering tasks. They have established a good tradition, to lay gas routes ahead of schedule. This is what happened at the gas pipeline Mozdok-Kazi-Magomed.

Based on the requirements of the food program, the Armenian gas builders for the first time laid ducts from the main gas pipeline to the large villages and regional centers of the fraternal republic.

With a feeling of a duty fulfilled, with good working mood, the gas builders are leaving the territory of Azerbaijan. They are heading for a new important route, the Urengoy-Uzhgorod export gas pipeline, into the Carpathian Mountains.

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PIPELINE CONSTRUCTION

UDC 621.643:621.791/551.481.2

NORTHERN PIPELINE-WELDING PROBLEMS, SOLUTIONS REPORTED

Moscow STROITEL'STVO TRUBOPROVOD in Russian No 9, Sep 82 pp 9-10

[Article by A. G. Mazel' (VNIIST [All-Union Scientific-Research Institute for the Construction of Trunk Pipelines]): "Peculiarities of Pipeline Welding under Northern Conditions"]

[Text] The main volume of current welding operations in pipeline construction is being carried out in West Siberia. Mighty multiple-strand systems 1,420 mm in diameter and designed for a pressure of 7.5 MPa, are being built here. Construction at the fields themselves is being expanded. Construction is marked by the necessity to weld thick-walled pipe, particularly for gaslift systems that raise the pressure.

Especially complicated conditions, extremely low ambient air temperatures, and the large amount of swamp make work on the lines difficult. The operation of pipelines where there is frozen ground, much flooding of the route, and temperature deformations from heating the gas at the compressor stations leads in some cases to excessive strain on welded junctions. This requires the strictest observance of the welding technology, which is constantly becoming more complicated because of the introduction of new pipe steels and new pipe structure. Definite difficulties are involved in the trend toward an increase in the thickness of the pipe being welded, leading to embrittlement of the metal of the joint and the heat-affected area. Under these circumstances, automated welding processes provide for adequate stability of the prescribed technological programs.

In 1985 it will be necessary to provide for the use of automatic welding at 70 percent of the pipelines and for 100 percent monitoring of the quality of welded junctions. An increase in the volume of automated methods for welding pipelines will enable solution to the problem of increasing productivity and improving the quality of welding and assembling operations under West Siberian conditions.

During the 11th Five-Year Plan the pace of construction can be raised to a great extent by automating the welding of pipe sections at the pipe-welding bases, where automatic submerged arc welding and resistance welding with continuous flashing at BTS and PLT type installations will be used.

The welding of nonrotary joints, which comprise about 30 percent of all the welding work volume, can be automated by about half through the use of contact welding by means of mobile machinery and by satellite automatic arc-welding machines.

The semimechanized SST-PAU type pipe-welding bases that are being used today for the submerged arc welding of pipes into sections do not provide high productivity because of the large number of manual operations during assembly and welding.

Therefore, it is desirable to equip the large welding-and-assembling brigades that work in West Siberia at a pace of more than 1 kilometer per shift with pipe-welding bases of the BTS type, which are intended for two-sided automatic submerged arc welding without a manual backing run. Several such bases are already at work in West Siberia, where a daily productivity of up to 480 meters of 1,420-mm diameter pipeline is being achieved.

A peculiarity of the BTS-type base is the possibility of welding both two- and three-pipe sections. Putting the workplace under fixed roofs enables work to be performed under any weather conditions.

Up to now resistance welding has been used only for pipe 114-530 mm in diameter, at TKUS-1 and TKUS-2 type installations.

The Institute imeni Ye. O. Paton, jointly with VNIIST and the Kiev Branch of the Gazstroy Mashina SKB [Special Design Bureau], is creating a new generation of such installations. PLT-321 type bases, unlike the TKUS type installations, will enable pipe 114-325 mm in diameter and with thicker walls to be welded. This is extremely important in the construction of gaslift systems. Installations for welding pipe 1,420 mm in diameter are also being created.

The welding of 57-mm diameter satellite pipelines at the operating fields can be mechanized with the use of arc-contact installations or of brazing.

An increase in the proportion of pipelines that are being built from thick-walled large-diameter pipe especially affects growth in the labor intensiveness of welding under field conditions.

During the current five-year plan, about one-third or one-fourth of the pipeline will be welded manually, but under a new technology, which is founded on a deeper breakdown of welding operations and the use of the flow-line breakdown method of manual arc welding by large brigades. This will enable the productivity of this process to be increased to the maximum. This method has found its widest application at West Siberian construction projects, where a large number of industrial flow-line groups that include 30 electric welders are at work. Here each welder carries out a strictly defined operation. The pace of the flow-line that erects 1,420-mm diameter pipe is as much as five joints per hour. This organization of pipeline welding enables labor productivity to be increased by at least 25 percent, without huge capital expenditure.

As pipe strength increases and wall thickness grows, the reaction of the affected area near the welded joint to the thermal cycle of the welding and to the hydrogen that is dissolved in the metal during welding with cellulose-coated electrodes becomes increasingly important. Therefore, the problem of replacing these electrodes with similar electrodes with lime-fluorspar coating is urgent.

The principle of a deep breakdown of operations, which is characteristic for manual welding, can be used successfully also during automatic arc welding of nonrotary pipeline joints.

This principle is used with automatic welding in a shielding atmosphere with a thin electrode wire on Duga-type installations. Output per worker when welding under protective gases is higher than when welding with stick electrodes. However, the appearance of such specific defects as faulty fusion around the edges and between layers is characteristic of this process.

Resistance welding with continuous flashing is being developed intensively in our country. A mix of mobile machines for welding pipe from 114 to 1,420 mm in diameter is being created. Machines for pipe 720 mm or more in diameter are being developed in a version that propels itself within the pipe. Portable electric-power stations of 500-1,500 kW capacity are being created.

Definite experience in the operation of Sever-1 type complexes, by which several hundred kilometers of pipeline have been welded, has been built up. A deficiency of the existing facilities is the impossibility of overcoming the turn angles of the route. Designs for machines that will enable this deficiency to be avoided are now being developed. Experience indicates that resistance welding should be combined rationally with arc welding at crossings, in swampy sections, on large slopes, and so on.

It is desirable, in combination with resistance welding, to use arc welding with flux-cored electrodes and positive shaping of joints by means of special cooled copper shoes. This method has been realized in practice under field conditions for welding pipe that is 1,020, 1,220 and 1,420 mm in diameter with a strength of up to 600 MPa. This technology is being refined for pipe with walls of various thicknesses.

The use of PPAN-19 flux-cored electrodes, combined with conversion to welding with low heat-input values, has in principle permitted the problem of obtaining optimal properties at welded-pipe junctions to be solved in all zones, included the zone affected by heat and fusion. As steels of new strength categories appear, new grades of flux-cored electrodes should be introduced.

In order to weld nonrotary joints of pipe 1,220 and 1,420 mm in diameter with flux-cored electrodes with positive shaping of the joint, the Styk complex of equipment has been developed and is being produced in series by industry. Self-propelled welding installations of this complex have been mounted on crawler tractors in whose cabs power-supply modules have been placed. This technology is distinguished by simplicity and mobility, the potential for use under various climatic conditions, and stability in welding quality, with good economic indicators. One Styk-type installation controlled by two operators replaces four highly skilled welders.

Styk-2 type installations for industrial pipelines 530-720 mm in diameter have now been created.

Special attention should be paid to the quality of repair and special welding operations--the incisions for fixtures and coils, the welding of reducers, turning angles, and sags, and so on. These operations include both cutting and manual arc welding. Experience indicates that where the amount is comparatively small (4-5 percent of total welding volume), such junctions are more subject to destruction during operation. Where this work is done, there is a great probability of deviation from the required parameters of precision for the assembly and welding regimes. It is known that it is also difficult to monitor the quality of these junctions.

It is desirable to unify such welding junctions. The use of operational patching should be prohibited. The certification of electrical welders and gas cutters engaged in repair and special operations should be conducted systematically.

New types of steel and pipe of new structure are beginning to be used in pipeline construction. Heat-treated steels that become softened in the heat-affected zone require during welding the use of the effect of resistance hardening of the soft interlayers that arise. Precipitation hardened steels in whose heat-affected areas carbides and carbonitrides are formed and whose weldability often cannot be characterized by the ordinary formula for the equivalent of carbon are governed by more complicated principles. In the modern era clad pipe does not present great complexity in terms of weldability. However, the precision of assembly of these pipes and their rigidity are still, in many cases, inferior to monolithic pipe. The basic operating parameters for the welding of multiple-layer and two-layer pipe will be checked at a test section at the Kazym Compressor Station.

Even while new problems are being solved, existing methods for cutting and welding must be improved.

The reliability of junctions made by resistance welding under various load conditions must be studied, and suggestions for increasing the reliability of the junctions made by this method are to be prepared. It is necessary to determine the criteria for evaluating the quality of the junctions and to develop a methodology for ultrasonic monitoring of welded junctions that are made by resistance welding flashing.

The problem of searching for more rational and more potent mobile energy sources for resistance welding, for heating prior to welding, and for heat treating is important.

Attention should be devoted to developing basically new sources of electricity that will insure the prescribed current pulsation during welding and will facilitate high-quality execution of both automatic and manual arc welding of nonrotary pipe joints.

Relative to West Siberia, where it is difficult to deliver freight, it is necessary to strive to the maximum to use a tankfree technology for welding and cutting, and, in particular, to dispense with the flame heating of joints prior to welding, which in some cases can be replaced by induction preheating. Pipe can be cut here by air and plasma installations without oxygen, acetylene and substitutes for them.

Centering mounts, especially for thick-walled pipe, where substantial force is necessary for mating the edges, require further improvement.

These and other pipeline welding problems are being studied in detail by VNIIST, the Institute of Electrical Welding imeni Ye. O. Paton, and some institutes of other cooperating branches.

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CSO: 1822/56

PIPELINE CONSTRUCTION

BOOK ON UNDERWATER PIPELINE CONSTRUCTION REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 8, Aug 82 pp 46-47

[Review of book, "Stroitel'stvo podvodnykh truboprovodov" [The Construction of Underwater Pipelines] by B. M. Kukushkin and V. Ya. Kanayev. Nedra, 1982, 176 pages]

[Text] Izdatel'stvo Nedra has published the book, "Stroitel'stvo podvodnykh truboprovodov" (1982, 176 pages, 50 kopecks), by B. M. Kukushkin and V. Ya. Kanayev in the "Biblioteka stroitelya magistral'nykh truboprovodov" [Library of the Trunk Pipeline Builder] series.

The book reviews the organization and methods for erecting pipeline crossings over water obstacles. The basic requirements for choosing the alignments, the technology for performing the earthmoving work under various natural and climatic conditions and the welding-and-assembly and insulation-and-laying operations, methods for testing underwater pipelines, and so on are cited.

Much attention is paid to the peculiarities of building in the country's northern regions.

Using the practical recommendations made in the book will help in doing the work in the shortest possible time at the least cost in labor.

The material that explains the organization of preparation for building a crossing is important. It is true that making preparations is one of the decisive prerequisites to the timely completion of work on a crossing. Supplying the construction organizations on time with design and budget-estimating papers, the delivery of pipe and building materials by the prescribed deadlines, the choice of optimal transport schemes, the erection of storage facilities, workshops, temporary docks and domestic-services premises, and so on are components of successful organizational preparation.

Measures for engineering preparation for construction (acceptance of the route, allocation of it, assessment of working conditions, and preparation of the plan for doing the work) are given in a logically valid sequence, with specification of a multitude of operating details that have practical value.

Earthmoving is the most labor intensive and expensive work. Its cost comprises, as a rule, 50-60 percent of the cost of the whole crossing. In a chapter dedicated to these operations, recommendations are made that will permit choice of a variant

for conducting them that is optimal in terms of expenditures, taking into account the specific construction conditions. Methods for excavating shore ditches with various mechanisms (bulldozers, excavators and floating equipment) are elucidated, methods for cutting underwater ditches across small, average-size and large rivers and data on the technology for doing the work during winter, and so on, are explained here.

Operating schemes, characteristics of mechanisms and conditions that will insure work safety during blasting for the excavation of ditches, and so on, are presented in detail and will be useful to builders.

All variants of soil and operating conditions that are possible during the erection of complicated crossings across water obstacles of substantial length are analyzed with maximum thoroughness.

Recommendations on ditch digging in the winter are of special interest, since implementing them in the West Siberian environment will allow the effect of the seasonality factor to be reduced, and, therefore, the construction pace to be raised. Data on calculating the strength of ice cover, the computed values for permissible thickness of the ice under various loads, and safety prerequisites for moving people and transport over ice roads, and so on, will be useful.

The reliability of underwater pipelines is determined greatly by the quality of execution of welding-and-assembly and insulation-and-laying operations. The portions devoted to these questions contain data about the technical operating regimes, the most effective materials, and rational monitoring methods.

Ballasting (hold-down weights) provide a stable position for the pipeline on the bottom of the water body. The book describes the various methods of weighting, including the more progressive of them--the use of pipes that have been concreted at bases.

Laying pipelines underwater is an important operation. The main methods for doing this are dragging along the bottom of the water obstacle, free submersion and submersion with floating means or supports.

Data on methods for laying the pipe are given in the great detail that is characteristic of the whole book. Options for dragging, with the use of a flooded ditch and descent tracks are cited, and available traction equipment, unloading pontoons and rigging are examined.

Of indisputable use to builders are: technical data on descent tracks, characteristics of the traction equipment, the ratio of the tractive effort of the winch and the amount of rope used by the drum, and composition of the basic technical equipment and adaptations. The values of the tractive effort as a function of soil type, which are reduced to a table, have practical value.

Operating schemes and the results of computations of stresses on submerged pipe-lengths will help in more effective realization of methods of free submergence and of laying pipe from floating equipment and supports. Information about assembly of the underwater pipeline during winter is of interest.

One of the concluding steps in the erection of an underwater crossing is the laying of an underwater cable for communications. The cable is laid in the same ditch as the pipeline (the combined method) or in a separate ditch (the separate method). The descriptions of these methods include operational schemes, organizational measures and recommendations on doing the work in winter.

Testing of an underwater pipeline is done in three steps: after welding it on shore; after laying it on the bottom; and, finally, after completion of the whole section of the trunk pipeline.

The regimes and sequence of performing operations for all three steps are reviewed. Specifications for pressure testing of the units are given. The requirements for turning over completed facilities and using safety equipment during underwater operations are set forth.

Workers engaged in laying underwater trunk lines will find in the book useful information about the most rational rigging accessories, methods for joining the various cables and ropes, and the forces permitted when using slings, block and tackle, anchors and other items.

In the book's appendices are technical data about machinery and mechanisms, material consumption norms, pipe specifications and calculated laying parameters. These data are presented in the form of tables that are convenient for practical use.

The book is intended for equipment operators and superintendents and chiefs of sections of production organizations that are doing the work on the underground routes.

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PIPELINE CONSTRUCTION

SELECTED SYNPOSES OF ARTICLES IN 'PIPELINE CONSTRUCTION,' SEPTEMBER 1982

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 9, Sep 82 pp 31-32

UDC 621.643/553.002.2+338.409.4(571.1)

WAYS TO FURTHER RAISE CONSTRUCTION EFFECTIVENESS IN WEST SIBERIA

[Synopsis of article by V. G. Chirskov, pp 2-4]

[Text] The results of work by Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] at West Siberian construction projects are cited. Prospects for further intensifying construction performance by reequipping with machinery and introducing progressive work methods are indicated. It is noted that an important area for raising the effectiveness of oil and gas construction in West Siberia is improvement of its management and economic mechanism. The necessity for completing fully the transition to the system for planning and evaluating the economic activity of organizations by construction commodity output and the conversion to two-year planning in the erection of trunk pipelines is pointed out. The important role of raising economic effectiveness of construction performance and further developing the brigade form of organizing work is noted.

UDC 338.23:658.62.018/621.643

RAISING THE RELIABILITY OF PIPELINES BEING LAID IN WEST SIBERIAN REGIONS

[Synopsis of article by A. M. Zinevich, pp 6-8]

[Text] Questions of the reliability of gas pipeline systems under West Siberia's special conditions are examined. Ways to raise the quality of the design and construction of pipelines, including such constructional elements as welded junctions, insulation coatings and means for electrochemical protection, are pointed out. Special attention is paid to the stability of gas pipelines in soils that are poorly consolidated and in swampy or flooded land, and constructional solutions for providing stability are given.

UDC 621.643:621.791/551.481.2

PECULIARITIES OF WELDING PIPELINES UNDER NORTHERN CONDITIONS

[Synopsis of article by A. G. Mazel', pp 9-10]

[Text] The main areas for developing welding and assembly work under West Siberian conditions during the construction of trunk pipelines and of pipelines at the fields

are pointed out. New pipe designs and operating equipment for automatic welding of pipe sections at bases by continuous flashing and for resistance welding, submerged-arc welding and welding with flux-cored electrodes are described. Questions of the quality of repair and of special welding work are examined. The desirability of unifying welded junctions and of introducing new standards documents to regulate welding-and-assembly operations technology is noted.

UDC 621.643.002.2

ORIENTATION TO MAXIMUM WORK EFFECTIVENESS

[Synopsis of article by P. P. Shabanov, pp 10-12]

[Text] The work results of a subunit of Severtruboprovodstroy [Trust for Pipeline Construction in the Northern Economic Region] during the construction of large-diameter trunk pipelines are cited. A special role is allocated to questions of introducing new equipment and technology for construction, the quality of facilities being erected, and the organization of the technical servicing and repair of construction machinery. The effectiveness of using the start-to-finish flow-line contract at the trust's construction facilities is pointed out. Socialist competition practice is publicized.

UDC 629.114.4.004.5

A SYSTEM OF CENTRALIZED CONTROL OF TECHNICAL SERVICE AT MOTOR POOLS

[Synopsis of article by A. S. Skrobov and V. A. Lozovik, pp 15-16]

[Text] The introduction at ATB-10 [Automotive Transport Base No 10] of Surguttruboprovodstroy [Surgut Pipeline Construction Trust] of the unit-section structure for technical servicing, which enables regularization of the production relationships among subunits and a system of reporting to be arranged and the functions of individual elements to be determined more accurately, is described. The structure of the system of centralized control of the automotive transport enterprise relative to pipeline route conditions is cited. One illustration.

UDC 553/621.643.002.2

PROBLEMS OF DEVELOPING PIPELINE CONSTRUCTION AT MIDDLE OB FIELDS

[Synopsis of article by V. M. Pavlyuchenko, pp 17-19]

[Text] The prospects for expanding work on building up the Middle Ob oilfields and on the construction of water lines for the formation-pressure maintenance system and of high-pressure gas lines for the gaslift method of recovering gas are pointed out. A scheme for organizing the work that will insure a rational workload for subunits and optimal flexibility of production resources is proposed. Measures for rationalizing managerial work are planned. An optimal set of machines of increased off-the-road performance for building pipelines during the summer is defined. Attention is paid to developing socialist competition in Glavtyumentruboprovodstroy [Main Administration for the Construction of Pipelines in Tyumenskaya Oblast] organizations. One illustration.

METHODS FOR ERECTING FOOTINGS AT THE URENGOY GAS FIELD

[Synopsis of article by V. M. Igol'nikov, pp 19-20]

[Text] It is noted that the pace of assimilating the gas and oil fields of Tyumenskaya Oblast depend greatly upon the effectiveness of erecting footings and foundations. New constructional solutions for footings that are erected under complicated climatic and frozen-soil conditions are proposed. A method for local thawing that will permit the properties of frozen soils to be improved is described. The specifications of the means of mechanization that are used are given. One illustration.

UDC 624.09.073-412

HOUSING CONSTRUCTION GOALS IN TYUMENSKAYA OBLAST

[Synopsis of article by I. P. Varshavskiy, pp 25-27]

[Text] The role of Glavzapsibzhilstroy [Main Administration for Housing Construction in West Siberia] in the erection of industrial, housing, and cultural and domestic buildings in Tyumenskaya Oblast is pointed out. It is noted that substantial reserves for building up housing-construction capacity exist with the conversion to large-panel construction and the introduction of the fully outfitted module method for erecting buildings and structures. Two illustrations.

UDC 658.2/62.001.7

INTRODUCTION OF PROGRESSIVE METHODS FOR HOUSING AND NONINDUSTRIAL CONSTRUCTION

[Synopsis of article by V. F. Krivonosov and I. P. Derevyagin, pp 27-28]

[Text] Progressive methods for housing and nonindustrial construction that are used by Glavzapsibzhilstroy [Main Administration for Housing Construction in West Siberia] production enterprises are described. It is noted that most of the processes are to be transferred from the construction site to factory environments. Proposals for a comprehensive program for improving the technology of operations at construction-industry enterprises are cited. Work experience of the main administration's leading organizations in this area are given. Progressive construction materials and structure and advanced methods for organizing the work are described. One illustration.

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PIPELINE CONSTRUCTION

SELECTED SYNPOSES OF ARTICLES IN 'PIPELINE CONSTRUCTION,' AUGUST 1982

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 8, Aug 82 pp 47-48

UDC 621.643.002.2/630

BUILDERS' TASKS TO REALIZE THE FOODSTUFFS PROGRAM

[Synopsis of article, pp 2-3]

[Text] The tasks of Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprise] collectives to fulfill the decisions of the May 1982 CPSU Central Committee Plenum are spelled out. The work that should be done by the industry's subunits to realize the USSR Foodstuffs Program are: the successful construction of oil and gas industry enterprises, the erection of facilities of the agricultural-industry complex, increase in the output of industrial products for agriculture, the development of subsidiary farms, and extension of sponsorship-type assistance to the countryside.

UDC 621.643/553.002.2+62.001.7

ROLE OF THE KOMSOMOL IN DEVELOPING FUEL-TYPE POWER ENGINEERING

[Synopsis of article by B. E. Shcherbina, pp 4-5]

[Text] The address of the USSR Minister of Construction of Petroleum and Gas Industry Enterprises at the 19th Komsomol Congress, in which he noted the major contribution of the industry's Komsomol members and of its youth in developing the country's fuel and power complex, is reported. Tasks of the young builders to develop new oil and gas recovery regions and to build oil and gas trunk pipelines during the 11th Five-Year Plan are described.

UDC 553.002.2(511.1)+62.001.7

INTRODUCTION OF SCIENTIFIC AND TECHNICAL ACHIEVEMENTS AT WEST SIBERIAN CONSTRUCTION PROJECTS

[Synopsis of article by A. P. Kholmogorov, pp 12-13]

[Text] A description of the developments of the enterprise Siborggazstroy [Siberian Institute for the Introduction of Advanced Methods for the Construction of Gas Industry Enterprises] that are intended for the builders of West Siberia's oil and gas

field facilities is given. The conduit-free method of laying heating grids with hydrophobic bituminous-keramzit insulation, the technology for protecting pipes from corrosion by the aluminizing method, a new method for protecting tanks from electrochemical corrosion, and a number of other engineering solutions proposed by the enterprise will help to raise construction quality. Prospects for work of the Siborggazstroy enterprise during the 11th Five-Year Plan are pointed out.

UDC 65.011.56

AUTOMATED CONTROL SYSTEMS AN IMPORTANT RESERVE FOR INTENSIFYING PRODUCTION

[Synopsis of article by P. A. Monakhov, pp 16-17]

[Text] The example of the establishment of an ASU [automated control system] in Tatneftestroy [Tatar ASSR Oil Production Association] show the importance of automated control systems in intensifying production. The contribution of specialists of the association's Orgtekhstroy [State Trust for the Industrialization of Construction] and information and computations center in improving the ASU-Tatneftestroy was noted. The necessity for close collaboration of developers and clients in the process of designing and introducing the system was emphasized.

UDC 621.643.002.2+658.5

CURRENT PLANNING AND CONTROL IN PRIMARY PRODUCTION COLLECTIVES

[Synopsis of article by V. A. Tolstolugov, pp 18-19]

[Text] The basic steps in transforming organizational forms at the primary-production collective level in connection with the conversion from specialization by type of work to specialization by construction stage are indicated. Major attention is paid to questions of the organization and functioning of the central information and control services. The functioning of the current planning and control system in a number of primary production collectives on the Urengoy-Gryazovets-MOK [Moscow District Gas Ring] and Urengoy-Petrovsk gas pipelines and the Surgut-Polotsk oil pipeline are analyzed. Practical recommendations on the design of control systems are given. One table and one illustration.

UDC 621.643/553.002.2+338.45

FACTORS THAT AFFECT PROFITABILITY OF CONSTRUCTION WORK

[Synopsis of article by V. N. Gelya, pp 20-21]

[Text] An analysis is given of the results of the production and economics activity of Glavukrneftegazstroy [Ukrainian SSR Main Administration for the Construction of Oil and Gas Industry Enterprises] construction organizations. The basic factors that affect the operating profitability of a number of the main administration's subunits are revealed. Ways to eliminate deficiencies noted are planned.

UNDERWATER CROSSINGS OF PIPELINES THAT TRANSPORT TOXIC PRODUCT

[Synopsis of article by A. M. Zinevich and S. I. Levin, pp 22-23]

[Text] The importance of creating trouble-free structure and improved technology for building pipelines that transport toxic product is pointed out. The causes of malfunctions of underwater pipelines is analyzed. The design of "pipe-in-pipe" type pipelines is reviewed. The results of full-scale and experimental tests are cited. It is noted that the given structure meets the requirements for the protection of water bodies from pollution by toxic product. One table and one illustration.

UDC 622.692.4.071:624.138

ARTIFICIAL STABILIZATION OF SOILS WITH PETROLEUM-REFINING EFFLUENT

[Synopsis of article by L. A. Babin, L. I. Bykov and S. K. Rafikov, pp 23-25]

[Text] The stabilization of heavy loams, sandy loams and slightly sandy soils with viscous compositions with an increased organic binder content that are obtained from residues of thermal cracking of crude oil is reviewed. The results of laboratory tests of samples of the stabilized soil are cited. Recommendations are made on the use of such soils for stabilizing soil backfill for pipelines on protuberant curved surface sections, soft flooded soils, loose soils that slip, and material that is being washed away on slopes and in small streams, and for building roads along the route.

UDC 621.643.001.5

CONSTRUCTIONAL STRENGTH OF TWO-LAYER LARGE-DIAMETER STRAIGHT-SEAM PIPE

[Synopsis of article by V. A. Lupin and A. S. Bolotov, pp 25-26]

[Text] Structure for underwater crossings consisting of two-layer pipe 1,020 and 1,220 mm in diameter with the space between layers filled with cement mortar are examined. The results of testing of specimens of the pipe are cited. It is noted that the two-layer 1,220 mm diameter pipe made of 10G2F steel has satisfactory constructional strength and, after being finished, can be used to erect trunk gas pipelines that are designed for increased pressure. Two tables.

UDC 621.643.001.5

EFFECT OF LONGITUDINAL COMPENSATION AND PARAMETERS OF A FOOTING ON BEHAVIOR OF A COOLED PIPELINE

[Synopsis of article by N. A. Nikolayev, A. Ye. Polozov and V. M. Sharygin, pp 27-28]

[Text] The results of an analysis of the effect of a two-layer foundation and compensation for stress and displacement of a low-temperature pipeline are cited. Indicators of the status of a pipeline at various foundation parameters are reviewed. It

is noted that in studying the foundation's mechanical properties, special attention should be paid to the parameter of maximum shear, which determines in the highest degree the pipeline's behavior. The necessity for using special arrangements to compensate for longitudinal displacement of an underground low-temperature pipeline is pointed out. One table and four illustrations.

UDC 621.623.001.24

TEMPERATURE-STABILIZATION PERIOD OF BURIED PRODUCT PIPELINES IN HYDRAULIC TESTS

[Synopsis of article by A. A. Sverdlov, V. I. Mogil'nyy, V. I. Kozitskiy and others, pp 29-30]

[Text] The connection between change in temperature of a pressurized medium and the pressure for the buried pipeline is pointed out. In order to solve the problem of a nonstationary heat exchange at the boundary of a pipe and a pressurized medium, a mathematical model of the process was developed, and a computational algorithm and a program were compiled for the computer. Processing of the computational results has enabled the influence of pipeline diameter on the time of temperature stabilization to be found. The cited methodology is suitable for practical determination of the temperature stabilization time of product pipelines 200 to 600 mm in diameter where the soil's heat conductivity is 0.7 to 2.35 watts. Three illustrations.

UDC 621.643.4.002.72

MECHANIZATION OF THE PRODUCTION OF COUPLING PARTS FOR PIPELINES

[Synopsis of article by V. V. Golovkov, pp 31-32]

[Text] New operating equipment designed for producing branch pipe 1,420 mm in diameter with a bending radius of 7,000 mm, which includes an installation for cutting off the trailer of the stamped halves of the branch pipes and T-joints, a stand for assembling branch pipes, and an accessory for gas-flame facing, is described. The use of said equipment at the Novosineglazovsk Constructional Structure Combine has enabled labor-intensive industrial operations to be mechanized and the required work quality to be provided for. Three illustrations.

UDC 621.643.4.002.72

ASSEMBLY OF T-JOINTS MADE OF STAMPED HALVES

[Synopsis of article by V. A. Pirogov, pp 32-33]

[Text] The technology of the manufacture of stamped and welded T-joints with elongated neck, which calls for a combining of the edges along the internal diameter, is described. The design of stands for assembling T-joints 530 to 1,420 mm in diameter is cited. Recommendations are made for setup of the equipment. Two illustrations.

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GENERAL

INVESTMENTS INTO WEST SIBERIA PETROLEUM AND GAS COMPLEX ANALYZED

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR, SERIYA OBSHCHESTVENNYKH NAUK in Russian No 11, Sep 82 pp 85-89

[Article by S. D. Ageyeva and B. P. Orlov, Institute of the Economics and Organization of Industrial Production, Siberian Department, USSR Academy of Sciences: "Some Characteristics of the Investment Process in the West Siberian Petroleum and Gas Complex"]

[Text] Major plans for developing petroleum and gas fields are being implemented in Tyumen Oblast since the mid-1960s. It was on this basis that the West Siberian petroleum and gas complex was formed here,¹ the territory of which also includes the northern part of Tomsk Oblast. Creation and operation of this complex became a powerful catalyst of Tyumen Oblast's economic development: The overwhelming proportion of capital investments into its economy have been associated with this complex directly and indirectly. This provides the grounds for analyzing the characteristics of the investment process in the economy of Tyumen Oblast using the petroleum and gas complex as an example.

Creation of the USSR's main petroleum base at one of the main natural gas extraction bases here required enormous capital outlays: The proportion of capital investments into the West Siberian economy received by Tyumen Oblast increased from 23 percent in 1966-1970 to 33 percent in 1971-1975, and in 1976-1980 they even exceeded 50 percent.²

The unique features of the new stage economic development that began in the 1970s were predetermined in many ways by the conditions laid down in the previous period. Among them, the orientation and structure of investment activity, operating as factor of inertial development of the economy, is having the most significant influence on further economic growth.

A significant capital potential has been accumulated in Tyumen Oblast. Owing to the high rate of growth of capital investments, the dimensions of fixed productive capital increased almost fivefold in 1971-1980. Ninety percent of the industry's productive capital is concentrated in the region's specialized sectors (petroleum and gas). In connection with formation of the petroleum and gas complex, the oblast's population doubled, resulting in swift growth of the cost of fixed nonproductive capital.

In the late 1970s and early 1980s some objective conditions for development and exploitation of oilfields changed fundamentally. Some oilfields are now at their peak extraction rate. Petroleum extraction will soon begin to fall at the Samotlor deposit.³ Further growth and production will be achieved by exploiting some new oilfields; the increasing proportion of this increment will compensate for the drop in extraction at some of the existing deposits. Our calculations showed that given the existing production processes, every 1-percent decline in well yield reduces the output-capital ratio by 0.56 percent. Under these conditions satisfaction of the growing planned petroleum extraction quotas will require increasingly greater outlays on production by the complex. In 1981-1985 the volume of petroleum and gas condensate extracted from the West Siberian plain is to be increased by 26 percent, and its proportion in nationwide extraction will rise from 52 percent in 1980 to 62 percent in 1985. According to our calculations the relative capital-intensiveness of petroleum extraction will increase in the 11th Five-Year Plan by 35 percent in comparison with the 10th. The volume of capital investments into petroleum industry will correspondingly double. The capital-intensiveness of natural gas extraction will decrease owing to introduction of a large number of high-yield wells. But total capital investments into West Siberian gas industry will grow in the 11th Five-Year Plan by almost 1.8 times in comparison with the 10th.

One of the principal features of the West Siberian petroleum and gas complex's formation was a significant lag of the investment sectors--machine building and the construction base--from the rate of oilfield drilling and growth of petroleum extraction, which noticeably affected the level of development of the productive and social infrastructures. No preparations were made in the territory's infrastructure for creation of the facilities required by the specialized sectors (no "foundation" was laid for the investment process). Therefore, for example, transportation construction proceeded simultaneously with erection of oilfield facilities, or it was even behind. Moreover equipment and production processes that were not in keeping with the regional production conditions were used in the first stage of the territory's economic development.

New procedures for drilling oil wells and extracting oil that increased the petroleum yield, new ways of laying highways and transporting products, use of progressive materials and structures in construction, industrial construction methods and so on were introduced following a great delay.

This unpreparedness of the infrastructure made it necessary to invest additional financial and labor resources into the region, and it generated a number of complex production and social problems. Remaining unsolved, they are having an unfavorable influence on investment activity. We can note first of all the decrease in the rate of construction, which had an effect on the commissioning of finished facilities, on the dynamics of unfinished construction and on the cost of construction (see table).

As follows from the calculated data, the average construction time increased significantly. Fulfillment of the quotas for commissioning fixed capital decreased from 94 percent in 1975 to 59 percent in 1980.

Objective factors were responsible to some extent for the increase in the time required to build facilities--mainly the change in the structure of the facilities

Basic Characteristics of the Investment Process in Tyumen Oblast*

<u>Indicator</u>	1977		1978		1979		1980	
	entire economy	indus- try	entire economy	indus- try	entire economy	indus- try	entire economy	indus- try
Construction time, years	5.9	6.1	6.5	6.8	8.5	6.5	8.4	6.7
Time capital investments tied up, years	3.6	3.7	4.2	4.4	5.5	5.4	6.0	6.0
Capital investments available to construction starts, %	80	69	75	74	69	67	72	71
Concentration of capital in- vestments, %	51	50	60	54	60	60	62	60

* Calculated from reported data. We determined the average construction time as the ratio of the total estimated cost of facilities to the annual capital investment volume.

under construction: The proportion of construction projects having an estimated cost of up to 1 million rubles and an average construction time of not more than 2 years was about halved, but the proportion of large construction projects (costing more than 5 million rubles) requiring an 8-10 year period of construction increased. Concentration of capital investments at enterprises under construction, particularly at the expense of moth-balling some previously started facilities, is one of the methods promoting reduction of the construction time to the standard level. The level of concentration of capital investments has increased in Tyumen Oblast's economy (see table). But the availability of allocations and other resources to construction starts has declined. Apparently the policy of concentrating assets will have its results, in the first place, following a certain period of time, and in the second place in combination with a number of other measures involving the planning and control of the investment process. For the moment, however, as a result of redistribution of assets in favor of continuing construction a certain increase in the quantity of construction projects that are technically more than 50 per cent ready has been noted. In order that construction starts could be fully provided with capital investments, their entire annual fund would have to be spent on this purpose.

Let us determine the dynamics of the effectiveness of the investment process (Θ_t) in Tyumen Oblast in the 1970s, comparing the result of this process--commissioning of fixed capital (B)--with the outlays, the capital investments (K), and taking account of the delay effect:⁴

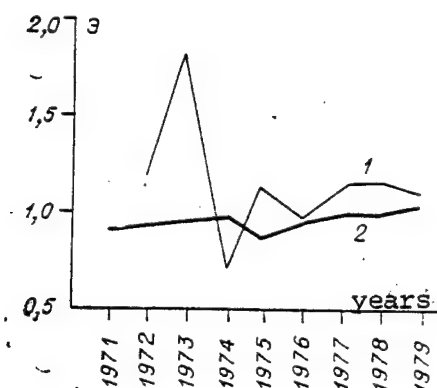
$$\Theta_t = \frac{B_t}{K_{t-L}},$$

where L is the lag.

To determine the size of the lag in capital investments we plotted the correlation function with a delay. The maximum value of the correlation coefficient indicated presence of a lag. The calculations were made for practically probable lag durations:

	=0	=1	=2	=3	=4
Productive sphere	0,497	0,983	0,927	0,781	0,701
Nonproductive sphere	0,988	0,933	0,950	0,802	0,883

The size of the delay in the productive sphere was adopted as 1 year, and it was adopted as 0 years in the nonproductive sphere--that is, capital is placed into operation in the year that the capital investments are made. The results of the calculations are shown in the figure below (the calculations were made on the basis of data covering 1971-1979).



Dynamics of the coefficient of the effectiveness of capital investments (Θ) in the productive (1) and nonproductive spheres (2).

The dynamics of the coefficient of effectiveness of productive capital investments (or the coefficient of reproduction of fixed capital) show that it declined in the late 1970s. Reproduction of fixed capital in the nonproductive sphere proceeds more uniformly, though the effectiveness level of capital investments is lower here. Note that this indicator cannot be used for interregional comparisons involving different lag durations. In this case we can use a formula accounting for change in the volume of unfinished construction:

$$H_{t-1} + K_t - C_t = B_t + H_t$$

or

$$\Theta_t = \frac{B_t}{K_t} = 1 - \frac{H_t - H_{t-1}}{K_t} - \frac{C_t}{K_t}$$

where C_t --capital investments that are not fund-forming, H_t --unfinished construction.

If we assume $C_t=0$, then the effectiveness of the investment process is determined by change in the volume of unfinished construction. In the period under examination here, it increased significantly on the territory of the West Siberian petroleum and gas complex.

The situation that evolved with capital construction in Tyumen Oblast rather accurately reflects the status of the country's construction complex. In the 1970s, when the capital-output ratios, the materials-intensiveness and the capital-labor ratio experienced growth, production of national income per ruble of gross product of the intersector construction complex decreased.⁵

Examining the similar trend in the economy of Tyumen Oblast, we need to consider the specific characteristics of the investment process.

First of all the 1970s were a time of stable decline in the proportion of non-productive capital investments within the total investment fund. This trend manifested itself distinctly not only in the inhabited regions of Tyumen Oblast's southern zone but also along the central reaches of the Ob' River, even though the need for facilities of the social infrastructure was keenly felt here. In the Yamalo-Nenetsk Autonomous Okrug, to which the center of investment activity moved in connection with development of gas fields, nonproductive capital investments increased by a factor of 2.2 in the 10th Five-Year Plan--somewhat more than for the oblast as a whole; however, their growth lagged behind the increase in population. The proportion of nonproductive capital investments with respect to total investment outlays in Tyumen Oblast in 1976-1980 was only 19 percent, which was significantly lower than in many of the country's inhabited regions.⁶

As a consequence the availability of housing and other facilities of the social infrastructure to the population hardly increased at all. Thus according to report data, in Surgut in 1981 there was only 7 m² of housing per resident, while in Novyy Urengoy it was 4.6 m². A significant part of the population is still living in ill-equipped housing--mobile homes and balki [translation unknown]. There are no plans for redistributing capital investments in favor of nonproductive construction in the 11th Five-Year Plan.

Second, the investment process in the West Siberian petroleum and gas complex has been typified by growth in the proportion of transportation construction. In this case the latter should in principle have the first priority because it is the most important prerequisite of economic development of new regions, though in practice we find that anticipatory creation of the transportation network has not yet been achieved. The main rail route, Tyumen-Surgut-Nizhnevartovsk--has an inadequate carrying capacity. The Surgut-Urengoy line, which is its natural continuation into the Far North, will experience the consequences of this constraint when it goes into permanent operation. We need to create conditions permitting extensive maneuvering of the capacities of the transportation network. But for the moment the central organs are not showing any initiative in solving this problem.

Growth in the scale of economic development requires continually increasing shipments of cargo to the West Siberian petroleum and gas complex. These shipments may increase fivefold in the 11th Five-Year Plan, mainly due to

products intended for the investment complex. In 1976-1980 capital investments into transportation development increased by a factor of more 2.5, while total capital investments doubled. It should be considered that about 80 percent of the assets are being allocated to construction of pipelines, and not transportation facilities for public use. This also is preventing us from achieving balanced development of transportation. In 1966-1980 more than 13,000 km of main pipelines were built in Tyumen Oblast to transport gas and petroleum, more than 10,000 km of electric power transmission lines were raised, and 3,000 km of motor highways and 1,500 km of railroads were built. In the 11th Five-Year Plan about 12,000 km of main pipelines, 3,000 km of motor highways and 650 km of railroads are to be placed into operation.⁷

Following the commissioning of the Surgut-Urengoy trunkline, the main capital investments into rail transportation should be earmarked for increasing the carrying capacity of the lines (developing station management and trans-loading approaches at river ports) and the capacity of rolling stock (intensifying locomotive management and so on). Capital construction in river transportation should be aimed at solving priority problems such as accelerated commissioning of wharf facilities and developing small rivers for shipping: In 1981 small rivers transported 22 percent of all cargo, and according to tentative estimates their proportion in the shipments may increase to 37 percent by 1990. In this connection we need to create a low cargo capacity fleet. Finally, we need to insure priority construction of motor highways and of a fleet of high capacity, dependably operating motor vehicles.

Third, we must achieve intersector balance in the capital investments into industry. In the past, late commissioning of productive capacities in sectors consuming raw materials led to significant losses of hydrocarbon products (gas obtained as a byproduct from petroleum extraction, unstable gasoline). The gas refineries that have been created are not in a position to refine all of the byproduct gas, and a significant proportion of it continues to burn away in torches. There are plans for raising the productive capacities of gas refineries in the 11th Five-Year Plan in proportion to the expected growth in byproduct gas extraction. To prevent losses of unstable gasoline, we need to hasten the commissioning of refining capacities at the Tobolsk petrochemical combine.

The volume of capital investments into the petroleum and gas complex planned for the current five-year plan is about double the outlays of the 10th Five-Year Plan. If we are to make use of the sharply increased investment resources, we need to insure proportional development of the construction base, improve construction processes and increase deliveries of equipment and material resources from other regions of the country.

FOOTNOTES

1. This concept does not have a strict definition in the literature: The West Siberian petroleum and gas complex is described in different ways in terms of its sector composition, and its geographical boundaries have not been clearly delineated. The USSR Gosplan includes in this complex all enterprises and organizations involved in exploratory and geological prospecting projects, the drilling of operational wells, extraction of petroleum, gas

condensate and natural gas (natural and byproduct gas obtained in conjunction with petroleum extraction) and construction and installation (equipping oilfields, laying transportation lines, motor highways and other utility networks, erecting gas refineries and so on).

A number of researchers favor inclusion of public transportation, petroleum refining and petrochemical industry and the social infrastructure into the composition of the West Siberian petroleum gas complex, in addition to its specialized sectors, geological prospecting and construction.

2. Calculated on the basis of data from statistical annuals published by the USSR Central Statistical Administration and RSFSR Central Statistical Administration.
3. IZVESTIYA, 13 November 1980.
4. The most logical and theoretically justified means of accounting for the lag is an econometric model of a spread-out delay, one in which commissioning of capital in a given year is a function of the proportions of investments made in a series of prior years. Several methods of evaluating the parameters of these functions have been developed. The simplest methods (by Koyk and Gupta) produce offset estimates. The Scientific Research Institute of Economics of the USSR Gosplan developed an algorithm which does not impose restrictions on the form of the function and which utilizes information only from dynamic series. Equality of the powers of all polynomials into which the series expand is a condition of its application. Verification of the information for Tyumen Oblast showed that this condition is violated.
5. Gorbunov, E., "The Construction Complex Within the Composition of the Investment Potential," VOPROSY EKONOMIKI, No 11, 1980.
6. Calculated on the basis of report data.
7. NEDELYA. No 19, 1981, p 14.

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GENERAL

SURGUT ADMINISTRATION MEETING DISCUSSES NORTHERN PROBLEMS

Moscow PRAVDA in Russian 29 Sep 82 p 2

[Article by V. Lisin, PRAVDA Correspondent: "First Travelers"]

[Text] Remembered for a Long Time

Surgut is called the gate to the northern oblast. But this is not only a large transportation center. Powerful subdivisions of geologists, builders and power engineers are based here. Nevertheless the main occupation is oil worker. The association "Surgutneftegaz" which was set up 5 years ago is now working several fields. The specialists say: the success of the oil worker is hidden at the end of the drill pit. The Tyumen drillers have to drill the same number of wells as in the five-year plan as they drilled in the previous 10 years. They have to this with practically the same forces as before. This why I went with special interest to the accountability-election meeting of communists of the second Surgut administration of drilling operations.

There are about a hundred members and candidates for members of the CPSU in the administration who are united into 8 party groups. They were friendly at the meeting, although many work tens of kilometers from the city. Among those assembled I noticed a well-proportioned, fellow with black eyebrows. This was Abil' Shukyurov, the drilling foreman! While heading the drilling brigade last winter made a record, 100,000 m of rock per year. Only a few did not reach it. This advanced the recent graduate of the Azerbaijan Institute of Oil and Chemistry to the acknowledged masters of high-speed drilling. Today he has already outlined the goal of overcoming this limit. The accountability-election party meeting is the first in the life of Abil': last spring he was chosen a candidate for membership to the CPSU.

The report of the secretary of the party office A. Parfenov was detailed. Those assembled listened to him attentively, sometimes stung to the quick, they looked around significantly. Shukyurov roused himself when the speaker began to talk about improving the responsibility of the communists for fulfillment of the requirements of the CPSU Charter regarding the development of activity of each. Then, in the break, he explained to me that he began from this, from increase in responsibility of each for the common work, having headed the brigade.

"Nothing has changed for us, neither supply of materials or equipment, nor the drilling equipment," added Abil'. "Only the attitude to work has changed. This had an immediate effect on the results."

The speakers spoke many times about personal responsibility for the work of the collective, expanding the circle of problems and illuminating new facets of the disturbing topic. V. Sidoreyko, the drilling foreman forced all of them to begin to think. He, in particular, shared the thoughts which he developed after he had visited one of the meetings of the "derrick workers," that is, those who install the drilling units for the drillers.

"We criticize the subcontractors, the derrick installers, the pluggers, the road workers. They did not do something, nor in time. But they also criticize us. And do not smile, they have grounds for their criticism. How do we usually act? We see disorder, we cry and head for the authorities. We write to the province. And this is how the matter stands. Because of trifles we separate the leadership from the work, although we ourselves could have done a lot to adjust and solve the problem. Among our contractors there are many communists and there are party groups. We have to set up daily contracts and achieve composition of forces!"

The secretary of the party committee of the association "Surgutneftegaz" E. Stryuk during the speech of the drilling foreman made many notes in a notebook. In fact, the interrelationships of the subcontractors are far from completion. In order to improve the situation, the party committee has introduced into practice joint meetings of the party offices of subcontracting enterprises. This yielded a positive result.

"The time has apparently come to disseminate this practice to the lower links, the party groups," said E. Stryuk. "At the next meeting of the party committee we will discuss this question."

Until recently the second administration of drilling operations travelled a middle road. Two years ago it was headed by G. Levin, who was famous throughout the country as a high-speed driller at Samotlor. Now the entire collective of the administration, and not individual brigades are faced with a set task of reaching the 100,000-limit of average drilling, a case unseen in domestic practice! As indicated by the accounting-election meeting, the collective is capable of this task. No one expressed doubts, and they reported finding ways to reach this limit faster.

At the Taiga River

From the window of the office of the head of the Oil and Gas Extracting Administration "Lyantorneft'," M. Nazargaliyeva, there is a beautiful view of the opposite shore of the taiga river Pim. Two years ago when the administration was set up here, there were several huts of local hunters and fishermen. Now there is a settlement in which several thousand people are living.

"Lyantorneft'" is an enterprise made of young people. It operates on two fields, the Bystrinskiy and Lyantorskiy. Even now they extract one-third oil more than previously. There are now tens of thousands of tons of oil above the plan on its account.

The administration has about 1,500 workers. Every tenth worker is a communist. Having been present at the accounting-election meeting in the second shop of oil and gas extraction, it seemed that I certainly understood why the administration from the first steps occupied a place in the first ranks of the association "Surgutneftegaz." Temporary workers did not come here, but masters to live and work. This is why everything is done with high quality with spirit.

This soundness with which the oil workers develop and inhabit the taiga land was felt even at the meeting. On the initiative of the communists, an administrative building of the shop was built with in-house forces this summer in which a reading room was installed. Now they decided at the meeting to build a cafeteria.

The housing problem is very acute in the Tyumen north. In the young settlement this is also true. It is true that a lot has been done here in a comparatively short time: every worker has, as they say, a roof over his head. But more should and needs to be done. This is indicated by the statements of the communists. The general contractor for construction of the settlement, the trust "Surgutneftepromstroy" is still doing poor work in this section. Last year the builders did not give the oil workers a single square meter of housing. This year introduction of 14,000 m² is expected. The oil workers themselves have constructed much more in this time.

In the settlement there are a lot of young people, and as yet there are no clubs or athletic structures. The communist do not want to put up with this situation. The administration with its own forces, adapting the warehouse rooms, is now erecting a "focus of culture." Of course, as noted at the meeting, this is the first solution to the situation. However it is necessary to look to the tomorrow of the settlement. Houses and small houses of every stripe are dazzling. The future city is being created not by the skilful hand of the architect, but by the grasping hand of the temporary worker. Apparently the USSR Ministry of the Oil Industry should be criticized. It clearly presents the future of the oil fields, but has a very vague idea of those cities and settlements where the extractors of the "black gold" live today and will live tomorrow.

The administration "Lyantorneft'" is located on the beautiful taiga river. The people here know how to work well, but they want to have a good life. The communists at the accounting-election meeting spoke about this, naturally not forgetting about their interparty matters.

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GENERAL

SOUTH YAKUTIYA POTENTIALS, PROBLEMS DISCUSSED

Moscow IZVESTIYA in Russian 18 Sep 82 p 2

[Article by S. Markin, chairman of the Yakutsk ASSR Council of Ministers:
"Hot Bed"]

[Text] The development of the riches of the Yakutsk south began in the last five-year plan. But construction organizations, the combine "Yakutuglestroy" and "Neryungrigresstroy" have already been set up and are increasing strength. The first phase of the Neryungri coal open pit, the power transmission line from Tynda have been put into operation, the Chulman GRES has been reconstructed, and construction is continuing on the country's largest coal enriching plant and the first phase of the Neryungri GRES. The city of Neryungri is growing.

One can judge even from this list the scale of work. South Yakutiya has become the largest construction site in the country, and this is only the beginning. Not everything is going smoothly here, and today I would like to share considerations about the lessons of the first years of construction and to correlate them with the outlook for this incredibly rich region.

In addition to enormous reserves of coking coal, iron ore, ferrous metals and set of all the necessary additives for the metallurgical industry, our south has fields of ferrous metals and semiprecious stones, apatites, granites, marble and high-quality clay. The south Yakutsk territorial-production complex has a rare raw material base not only for the extracting and refining industries, but also for setting up the industry of construction materials. This has a favorable effect on the cost and periods of construction of the enterprises of basic industry.

The first and the most difficult steps in developing the Yakutsk south have been made by the builders of the USSR Ministry of the Coal Industry and Ministry of Power and Electrification. Not everything in their work is going well, but we will be realists, it is difficult to take into consideration everything in a construction of this scale, and especially starting literally from nothing.

We can not even be happy with the numbers: since the beginning of construction, 632,000 m² of housing, children's preschool institutions for 1,450 places and cafeterias for 685 places have been completed, several schools have been constructed for 3,136 students, bases, warehouses, stores, etc. have been put into operation. The city has obtained a sewage system with biological treatment, and 3 water intakes. But the main construction, more or less rhythmic work occurred after start-up of the house building plant,

and although the plant has not yet reached rated output, one can already say with confidence that Neryungri within a year or two will receive a stable supply of about 100,000 m² of well-built housing every year. We could have started construction of the plant of large-panel house building and the base of the construction industry 2-3 years earlier, and loss for the construction would have been much less.

It is impossible here not to speak about the fact that remarkable foremen are working in the construction of the city. Among them we will name the brigades of deputy of the USSR Supreme Soviet A. Novolodskiy and A. Platonov. They are famous not only for the percentages of overfulfillment of the plan, but primarily for the truly creative attitude to work. The installers of Platonov have assembled the first large-panel house in Neryungri, shipped by truck from Yakutsk a distance of almost 800 km, and then set up houses of the Neryungri work. They were not quite successful in the plan, and the first batches were not successful in the quality of fabrication. They were not only unsuitable for assembly, but even for living. At the same time the furnishings of the plant had already been made for these houses. The Neryungri people themselves had to make corrections in the plans, and use a lot of outlays for re-equipping of the furnishings.

All of this can not help but suggest that the northern cities with their specific nature should be planned in the organizations which have a good idea about the construction conditions of the north.

The development of the social infrastructure is a difficult process. We will cite some figures. In recent years almost R 90 million were not assimilated in nonproductive construction. The consequence was that the workers did not receive 178,000 m² of housing, and many cultural-general facilities.

I will not name which facilities the Ministry of the Coal Industry is not building for every kind of reason for its workers, nor under what conditions of financing the Ministry of Power and Electrification places its builders. It goes without saying that all of this occurs because of the clear underestimation by them of the role of advanced development of the social infrastructure. An example of this order is the unjustified slow development of the construction industry. It has long been suggested that the plant of large-panel house construction be a combine. But the shop for production of claydite is not ready, the facilities for wood cutting and wood processing, the plant for mineral items and small-piece wall materials are not being built. All of this has been brought in from afar, often with delay. And the brick is delayed because it comes not only from Siberia, but also from the central oblast, reinforced concrete is supplied through the entire country from Kirovograd, and the lumber comes to Neryungri from Bratsk. At the same time, in the environs of Neryungri there is a raw material base for production not only of sand-gravel, but also brick, cement, finishing materials made of granite and marble, etc.

The experience of the first years of constructing the center of the territorial-production complex also indicated that there are difficulties of another order. The city-forming factors and the national standards for cities of the extreme north and the regions on the same status as them must be different than for the Crimea. They are practically the same. Even if we take into consideration the natural-climate conditions, we have

to have more housing for each city and places in the cafes and cafeterias, and swimming pools, libraries, out of town bases for recreation and athletic halls. For, in addition to the harsh climate, there is another circumstance here. The average age of the Neryungri resident is 25. But neither the Gosstroy nor the Gosplan has given a decisive word in order to correct the error. Is it not time to conduct planning based on the really formed situations and not erroneous hypotheses?

The builders of South Yakutiya have not succeeded in avoiding another old problem, interdepartmental disagreement. One can cite many examples which seem to be paradoxes. The houses on the central street of the city are built by two departments, and none of the elements of build-up around these houses are done by anyone. Why? This work has not been included in the estimates of any ministry.

The builders of Neryungri do not complain of their supply of food or industrial goods. Of course, in such a short time facilities could not develop in the taiga to provide the population with consumer goods, and a natural food base. But nevertheless the leading organizations of the city have already begun to create their own auxiliary services. This is praiseworthy and timely. Even under such difficult climate conditions in which the technical-production is, one can and should produce one's own food products.

However the basic questions of developing auxiliary services are not being solved here. The essence is the fact that the Ministry of the Coal Industry has been entrusted with constructing in the region of Neryungri a complex of agricultural enterprises. However, construction has not yet begun here of either a poultry plant or a dairy farm, or a greenhouse. According to the plans of the Ministry of the Coal Industry, some of the enterprises should be constructed in the end of this five-year plan, and the dairy complex in the future. But the plans do not go further. The situation is even worse with the creation of an agricultural complex for the power engineers.

I will repeat that in such a scale of construction as in South Yakutiya it is difficult to avoid miscalculations. We are concerned here not only with the fact of what has not been done, as what needs to be done in the near future. The hot bed of the Neryungri coals, like other treasure houses of the Yakutsk depths should be extracted by the most economical method. The hot bed is not a literary image, because the coal is extracted in severe frost in hot labor. Its extraction requires daily heroism. The working class of Neryungri demonstrates these qualities. Already this year about 4 million T of Yakutsk coal will travel on the small BAM [Baykal-Amur Trunkline] to the east and to the west of the country. Therefore we are concerned today not with the region which is under construction, but the region which is already working on the country's economy and which requires the corresponding attitude of all the ministries and departments involved here.

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GENERAL

DELAYS AT KATEK TRANSPORT CONSTRUCTION DEPLORED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Aug 82 p 2

[Article by B. Pichugin, head of the sector of the Krasnoyarsk CPSU kraykom:
"After the Ovations..."]

[Text] Whose fault is it that construction of the transport arteries of KATEK is slowing down.

The Kansk - Achinsk fuel and energy complex "KATEK" is the richest storehouse of inexpensive lignite. In the 11th Five-Year Plan, it is planned to start-up facilities here for extracting 21 million T of coal. This is almost one-third of the increase for the sector. The Berezovo GRES No 1 whose two power units with unit output of 800 megawatts should produce the first electricity at the end of this five-year plan is being erected.

As we see, we are concerned with an object of great state importance. It would seem that all the participants of the construction of the complex would understand this and would try to fulfill their duties in the best manner.

But recently the coordination council of the Krasnoyarsk CPSU kraykom, after examining the course of work at the facilities of KATEK, stated with alarm that there was a great lag in construction of the transport arteries of the complex. The Ministry of Transport Construction and its trust "Krasnoyarsktransstroy" essentially have been marking time for three and a half years.

In the past years, only one-third of the total estimated cost of the second approach road to the open pit "Borodinskiy" has been assimilated. In 1983 the customer, the association "Krasnoyarskugl'" suggested that the transport builders take a contract if only for R 4.1 million, but they agreed only to R 2.1 million. This is half the plan for this year.

This is the situation in the eastern section of the KATEK, but the situation is known better in the west. In February of this year (with a considerable delay versus the initial period) the approach road to the industrial area of the open pit "Berezovskiy No 1" was opened for temporary use. There were ovations, triumphant speeches and vows that in the first 6 months the road will be put into permanent operation. All the periods have passed, but the inspectors of the Achinsk railroad department do not yet have the grounds to change their previous conclusion: the approach road today does not meet the requirements of the regulations for technical operation, although up to 100 cars of coal per day and construction loads are already shipped on it.

During the entire three plus years, the trust received into the plan of contract work for the coal section of the complex an average of no more than one-third of all the volumes announced by the customer. And they generally did not cope with this program which was cut to the limit. In the first 6 months of this year, the annual plan was only fulfilled by 39 percent.

Does the Ministry of Transportation Construction really not see that its trust is being beaten like a fish on ice? Why do they not extend a hand of help? The leaders and responsible workers of the ministry have asserted many times that they will focus more attention on the facilities of KATEK.

They have been promising for a long time. Finally they dared to pass from word to business: the ministry made a decision in the first quarter of this year to place in the city of Borodino a construction-installation train which forced work on laying the second approach road to the open pit "Borodinskiy." The coal workers sighed with relief: the ice was moving. But they rejoiced too early: as yet neither a train nor even a peg, nor any kind of mark that the ministry has not thrown its words to the wind is at the site.

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GENERAL

URALMASH MACHINERY DESCRIBED

Moscow KRASNAYA ZVEZDA in Russian 22 Jul 82 p 2

[Article by Ye. Varnachev, general director of the production association "Uralmash," deputy of the USSR Supreme Soviet, delegate to the 26th CPSU Congress: "Traditions of 'Uralmash'"]

[Excerpts] In the Nazarov coal open pit of the Krasnoyarskiy Kray, the country's most powerful step-type excavator ESh-100.100 which was built in "Uralmash" with bucket volume of 100 m³ and boom length 100 m is working. The Kola geological exploration expedition with the help of the drilling unit "Uralmash-15000" has passed the 11-kilometer mark.

Our machines today determine the outlays of fuel and electricity per unit of product in key sectors of the economy: metallurgical, oil and gas extracting, coal and mine industry. We are therefore concentrating our main efforts on improving the quality and effectiveness of the industrial equipment made at the plant.

Over ten million tons of slabs per year is the total output of the unit of continuous teeming of steel "UCTS" created by "Uralmash" for the metallurgical plants "Azovstal'," Novolipetsk and Cherepovetsk. As compared to teeming of steel into an ingot mold, these units increase the output of finished product by 10-12 percent, and during the years of operation of these machines the country has received over 600 million T of steel in addition. Considerably less electricity is also consumed for each ton of steel blanks obtained with the help of the UTCS. Moreover, in recent years the designers of "Uralmash" have succeeded in significantly reducing the specific (in calculation per ton of product) metal-consumption of these units.

The drilling units "Uralmash-3,000 EUK" play a great role in developing the oil and gas fields of West Siberia. They can drill a whole "cluster" of wells from one place, up to 16, each of which is up to 3 km deep. In this case there is a reduction in time for installation of the equipment, and decrease in the number of brigades. The first models of these units weighed 590 tons each. The plant designers further not only improved the design of these units, but also reduced their weight by almost 100 T.

One can say that the advantage of these machines is double.. They produce more products, while less metal is used to make them. Especially successful models of new equipment have been developed by the designers of mining : machines, quarry and step-type excavators. Many have made machines whose specific metal consumption is lower than the best foreign models.

This work is continuing. In the first year of the 11th Five-Year Plan, the association made 16 new machines and new types of equipment.

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